

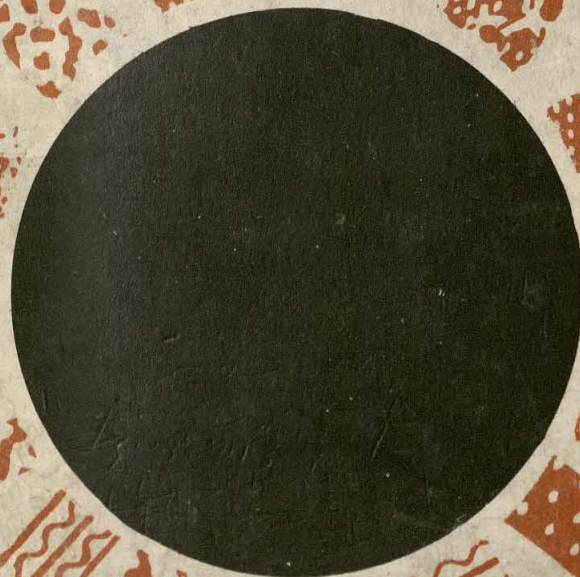
283

SOCIALLY USEFUL PRODUCTIVE WORK

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source book

volume III







**SOURCE BOOK
ON
SOCIALLY USEFUL PRODUCTIVE WORK
VOLUME III**

REPORT
ON
SOCIAL AND ECONOMIC PROGRESS
IN

SOURCE BOOK ON SOCIALLY USEFUL PRODUCTIVE WORK

VOLUME III

Activities for Classes IX and X

Prepared by

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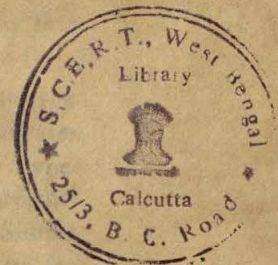
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एन सी ई आर टी
NCERT

राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्

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PREFACE

This is the third volume of the Socially Useful Productive Work Source Book series meant for Classes IX and X. The students when they come to the Standard IX will be about 14+ and, therefore, mature enough to select such activities which require deeper understanding of the inter-relations of various school subjects with SUPW and which will produce useful saleable goods. Some activities at this stage should necessarily be more comprehensive and of the project type, directed towards discovering special aptitudes for future vocations or professional studies. It is not necessary to make every activity complex to identify the special interests and aptitudes of the students, but the ability to do continuous hard manual labour necessarily has to be observed. One of the main objectives of SUPW in the school curriculum is to bring about a blending between theory and practice as far as possible in relation to various subjects of study. In this volume emphasis has been placed on the theoretical and practical aspects in the area of electricity. The student is gradually led from simple projects to those which are of daily use, without burdening him with more theoretical instruction than is needed. It is a well known adage that doing is learning and the student especially learns better in such abstract subjects as electricity and magnetism by preparing simple circuits and gadgets whose working he sees and experiences.

The volume consists of other activities in the areas of home science and commerce subjects. Running a cooperative store or a students' bank is an experience which inculcates the habit of taking responsibility and careful management of money and materials. Typewriting and shorthand are perhaps the most useful activities for any individual in the present-day society to be self-reliant, whether one chooses an academic or a vocational course. Simple home economics activities require only elementary knowledge to prepare saleable products for augmenting one's income or adopting them for self-employment. Electrical and electronic activities develop in the students skills that will enable them to repair and rig up simple domestic appliances.

In suggesting these activities a view has been maintained that the relevant elementary scientific principles, methods and techniques adopted are stressed at every stage. It is presumed that the teacher emphasises the principle of production, the usefulness of simple activities, dignity of labour, self-reliance, economic benefits and the joy of creating something new. Nothing gives greater pleasure and satisfaction to the student than seeing that what he has created with his own efforts and labour is useful. Every time he does something new he derives greater and greater confidence to depend upon his own intelligence, abilities and labour. It is through this that he will be able to see the economic gains to develop self-reliance. At the end of Standard X he will be sufficiently mature to select courses according to his aptitude and inclination. Thus, experience in and through work not only serves to develop manual skills and a sense of the dignity of labour but also helps in discovering the student's hidden talents and aptitudes, either for a vocation or for professional education.

PROF. C. V. GOVINDA RAO

Head

**Socially Useful Productive Work and
Vocationalisation of Education Unit**

16 April 1980

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The Vocationalization of Education Unit acknowledges with pleasure the assistance given by the Department of Teaching Aids in providing photographs of several electrical and electronic components and gadgets.

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(v) Chalk Toys

(vi) Raw Mango Pickle

(vii) Rice Paper

(viii) Chutney

(ix) Potato Bonda

(x) Vegetable Pickle

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(i) Transformer

(ii) Construction of a Transformer

(iii) Transformers on Alternating Current Circuit

(iv) A Room Heater

(v) Solar Telescope

Chapter 3

Electronics

(i) Some Components

(ii) Fabrication of Transistor and Capacitor

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Source Book on Socially Useful Productive Work

Volume III

(Classes IX & X)

1. To lead the students to participate increasingly in productive work, as they go from one stage of education to another, thereby enabling them to earn while they learn.
2. To provide opportunities for creative self-expression and for the development of problem-solving abilities.
3. To develop in them a desire to be useful members of the society.
4. To help the students in discovering their hidden talents and aptitudes such that they select a proper vocational course at the end of the secondary stage.

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1

Home Science

OBJECTIVES

1. To develop the skills and techniques of beautifying objects by mosaic work.
2. To enable the students to make pieces of jewellery themselves without using costly tools & materials.
3. To develop in students the skill of performing applique' work.
4. To develop in them the skill of making macrame' designs and prepare some simple utility items.
5. To help the students to prepare their own toys thereby giving expression to their creative imagination.
6. To develop in them the skill of preparing some tasty food items thereby developing an attitude of self preparation either for their immediate consumption or selling, if so desired.

I. Mosaic

MOSAIC ART

The mosaic art work is easy and is simpler than painting or clay modelling because you can change your design as many times as you wish.

MOSAIC

Mosaic can beautify many different objects such as ash-trays, cigarette cases, jewel boxes, lamps and even the walls of the kitchen. There are various kinds of mosaics and they require varied techniques, such as setting stones, mirrors, pearls, beads, marble, etc.

MATERIALS REQUIRED FOR A MOSAIC TABLE

1. Opaque glass mosaic tiles.
2. Tile nippers.
3. Impact adhesive.
4. A piece of Plywood.
5. Plastic strips.
6. Plastic mixing bowl.
7. A sponge.
8. A putty or palette knife.

9. Rubber gloves.

10. Table/Stool.

SETTING THE TILE ON THE TABLE

1. Make the design on the paper you wish to have.

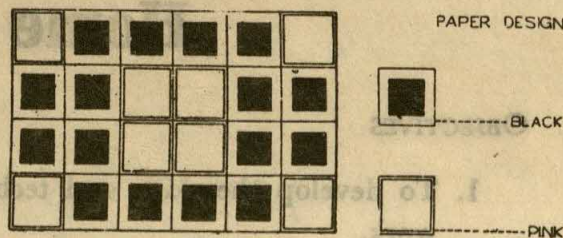


FIG. 1.1.1

2. Transfer it to the board.
3. Move the tiles around on the board until you get the design of your taste.
4. Leave space between tiles, as this will be needed later for the grout filling.
(You may get tiles in different shapes. With the use of nippers cut them in squares, rectangles, triangles, etc.) Do not worry if the cut edge is a little off the target; mosaic arrangement need not be exact.
5. As soon as you finish the design, you can begin to glue the tiles to the board.

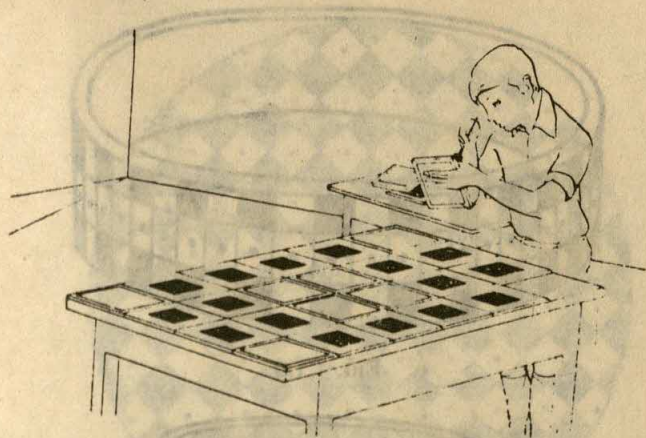


FIG. 1.1.2

6. Glue one at a time to the board with the adhesive.



FIG. 1.1.3

7. Remove the adjacent tile and glue it as you did previously.
8. Complete the design.
9. Allow the glue to dry well. This may take about 24 hours. Do not worry if excess adhesive oozes out slightly around the tiles as they get sucked into the grooves. The grout will cover this.
10. Prepare the grout paste. Put 3-4 cups of the grout powder into the mixing bowl. Add water and paste it with the help of palette knife. The paste should have the consistency of cake frosting. If the grout is too thin, cracks will appear when it dries; if too thick, it will be difficult to pour between the tiles.
11. Pour the mixture on the surface of the table.
12. With the help of a rag or cloth spread it around and fill the crevices between the tiles.
13. Clean the excess grout from the surface of the tiles, using a sponge or rag moistened with cold water.
14. Let it dry overnight.
15. Next day inspect the surface thoroughly and see if the spaces between the tiles are well filled with grout. If you find bubbles or cracks, mix a little more grout and apply where necessary.

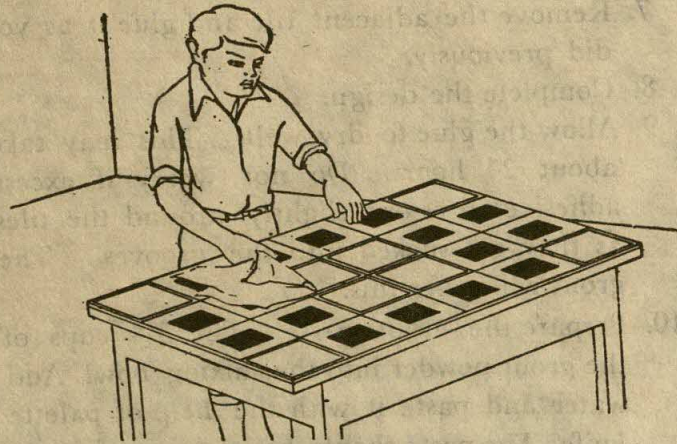


FIG. 1.1.4

16. Clean the surface again.
17. Fix the legs to the bottom of the table top.
18. Cover the surface with a damp cloth or plastic sheet and leave it covered for three or four days.
19. Apply a coat of silicone 'sealer' to protect the table from stains.
20. Your table is ready. You can use different materials of various shapes, colours, sizes and a range of textures. Prepare different types of things by using this technique such as trays, cigarette boxes, jewel boxes, toys, etc.

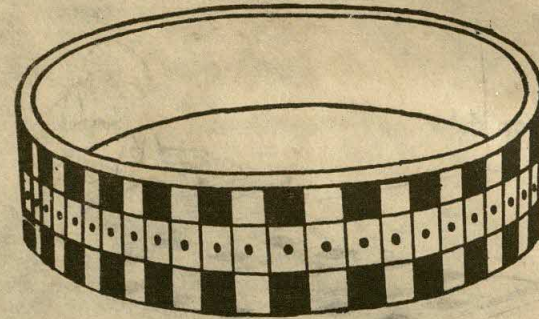


FIG. 1.1.5

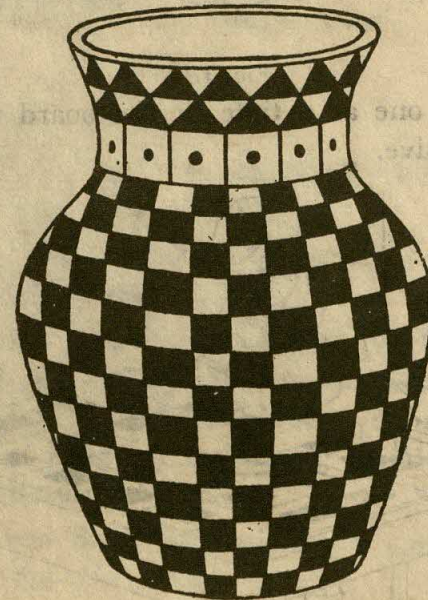


FIG. 1.1.6

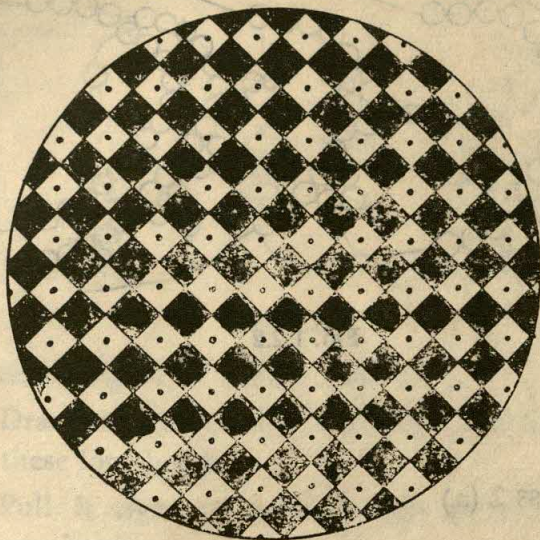


FIG. 1.1.7

II. Jewellery

Jewellery can be expensive particularly costume jewellery. Even then it is not always easy to find exactly what you want in the right colour and of correct size. Yet it is possible to make some very pretty pieces of jewellery yourself without using costly tools and materials.

You can create something original and inexpensive, too.

MATERIALS REQUIRED

1. Beads—Different colours and different shapes.
2. Thread—Strong nylon threads in different colours including some invisible threads are most useful.
3. Clasps—These can be purchased from the craft shops.
4. A pair of Scissors
5. Needle
6. Wire—You can use copper, silver or silver-plated wire. A medium or fine gauge wire produces the best results.
7. Wire Cutters—Available in hardware stores .
8. Pliers—You will need both flat-nosed and round-nosed pliers. Pliers should have smooth jaws.

9. Emery Paper—Medium or fine grade.
(also called wet and dry paper)

STRINGING THE BEADS

Nothing can be easier than stringing beads even children can do it. See figure 1.2.1.

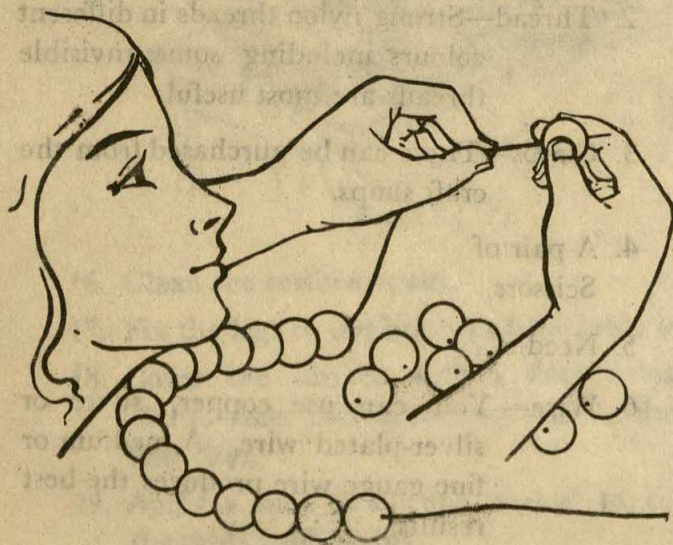


FIG. 1.2.1

But this is only the beginning of bead necklaces. Look at the figure 1.2.2. It is little more difficult.

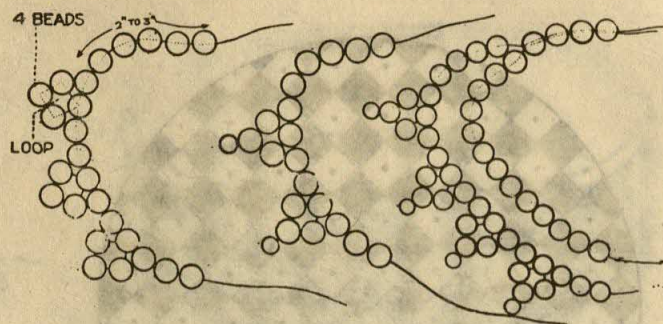


FIG. 1.2.2

PROCESS 2 (a)

1. String the beads until necklace is 5 or 6 cms. long.
2. String four more beads.
3. Draw the thread again through the first of these four beads.
4. Pull it tight forming a loop as shown in the diagram. (The loop can be at intervals of two or three beads.)
5. String three beads again.

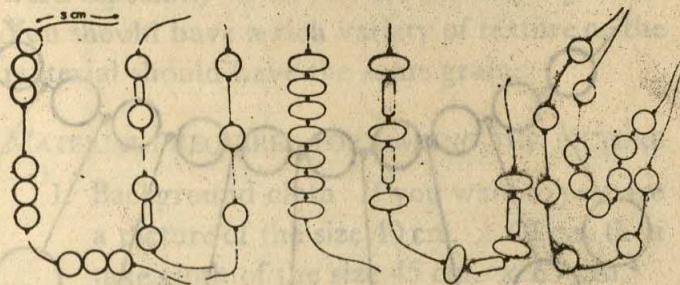


FIG. 1.2.3

6. String again four more beads.
7. Draw the thread again through the first of these four beads.
8. Pull it tight to form a loop as you did previously.
9. Repeat the loop design as many times as you desire to make the required length.
10. Attach the clasp or knot both ends of the thread very neatly.

Now you have your necklace ready for your wear.

NECKLACE PREPARED WITH THE HELP OF BEADS AND WIRE/THREAD

The beads are spaced about 4 cm. apart by making knots on each side of a bead as shown in the Fig. 1.2.3.

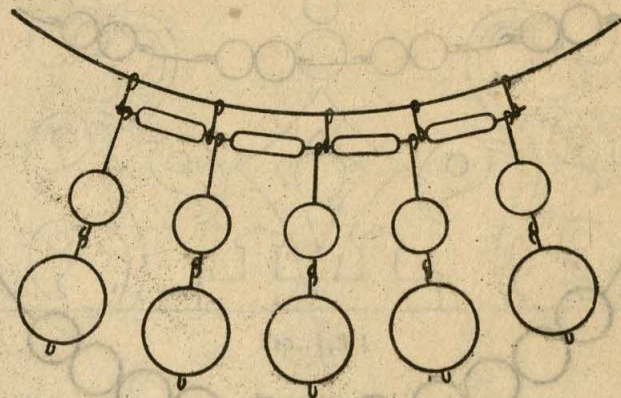


FIG. 1.2.4

1. Take any coloured nylon thread and tie one end of the thread around a pencil for attaching the clasp later. Use good lengths of thread to make the necklaces.
2. After leaving 3 cm. of the thread tie a knot as shown.
3. String three round beads.
4. Tie the knot as close to the last bead as possible.
5. Leave 3 cm. length of thread.
6. Tie a knot.
7. String three beads as you did previously.
8. Tie a knot as you did before.

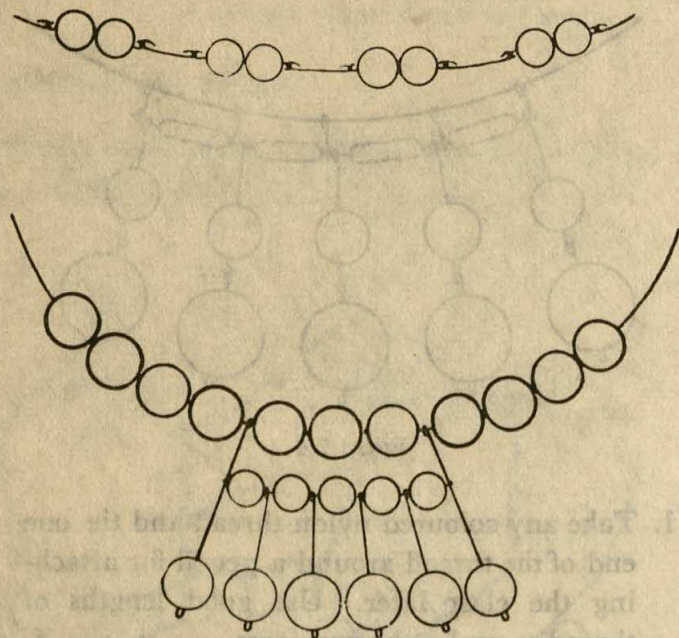


FIG. 1.2.5

9. Repeat this process until the required/desired length is made and attach the clasp.

(Beads or pearls of different shapes, colours and sizes can be used with the help of nylon threads of different colours and thickness. Instead of using threads you can use silver, copper or silver-coated wire.)

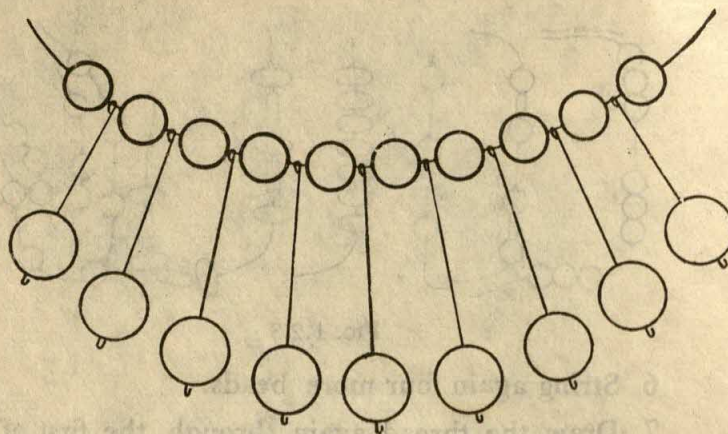


FIG. 1.2.6

III. Applique'/Patchwork

Applique' means applied or cuts from one material or fabric applied or stitched to the surface of another. The cut-pieces of the fabric should be fastened to the cloth very firmly. There are different methods of fastening. Hand or machine embroidery can be used for fastening purpose.

Texture plays an important role in applique' work especially when you are making a picture. You should have a rich variety of texture or the material should have the same grains.

MATERIALS REQUIRED FOR MAKING THE PICTURE

1. Background cloth : If you want to prepare a picture of the size 40 cm. $\times$ 60 cm. then take cloth of the size 45 cm. $\times$ 65 cm.
2. Coloured thread.
3. Mirrors, buttons or other kinds of materials.
4. Coloured clothes of different texture.
5. A pair of scissors, needle.
6. Paper, pencil-eraser, tissue paper and carbon paper.
7. Colours and brushes.
8. Fevicol.

INSTRUCTIONS

1. Make a paper design of the picture and colour it according to your choice. (Fig. 1.3.1)
2. Transfer the paper design on to the background fabric with the help of tissue and carbon paper.
3. Cut the fabrics according to the coloured design. (Fig. 1.3.2)

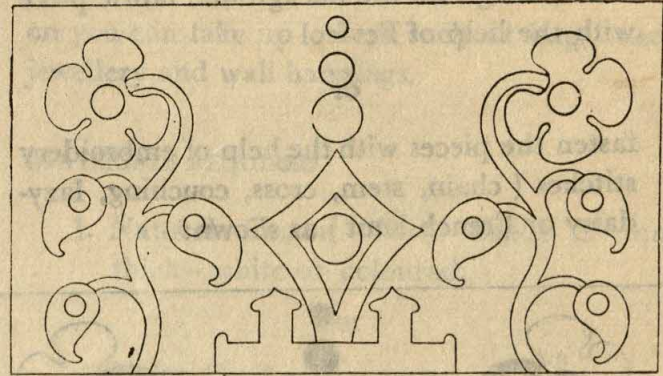


FIG. 1.3.1

4. Press the pieces of fabrics.
5. Fasten/paste the pieces of fabrics according

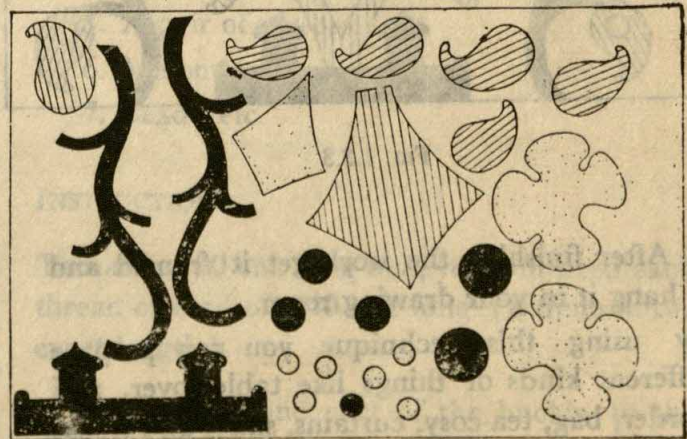


FIG. 1.3.2

to the design on the background fabric piece with the help of Fevicol

or

fasten the pieces with the help of embroidery stitches (chain, stem, cross, couching, lazy-daisy or French knot) as shown.

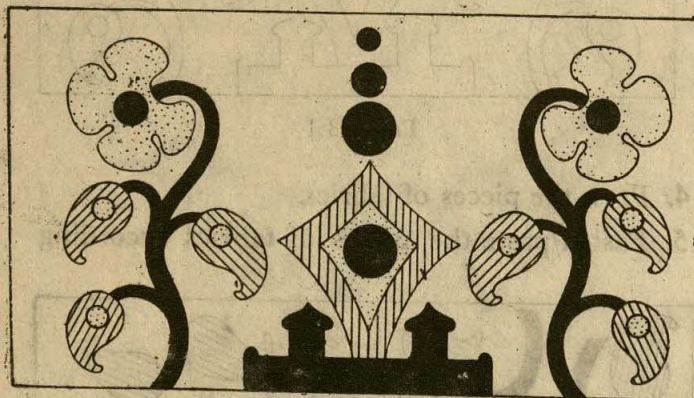


FIG. 1.3.3

6. After finishing the work get it framed and hang it in your drawing room.

By using this technique you can prepare different kinds of things like table-cover, sari border, bag, tea-cosy, curtains, shirts and frocks etc. Instead of using applique' work you can

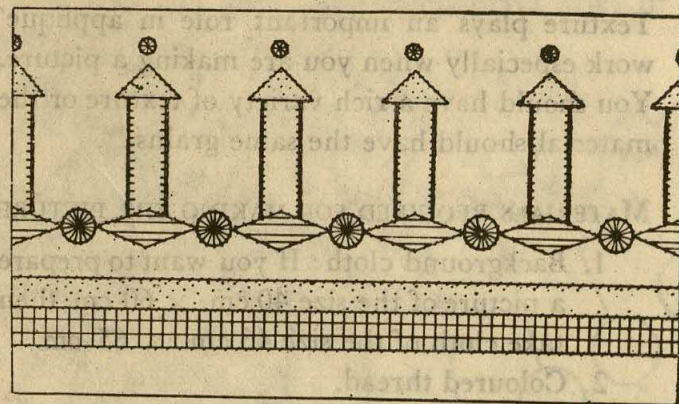


FIG. 1.3.4

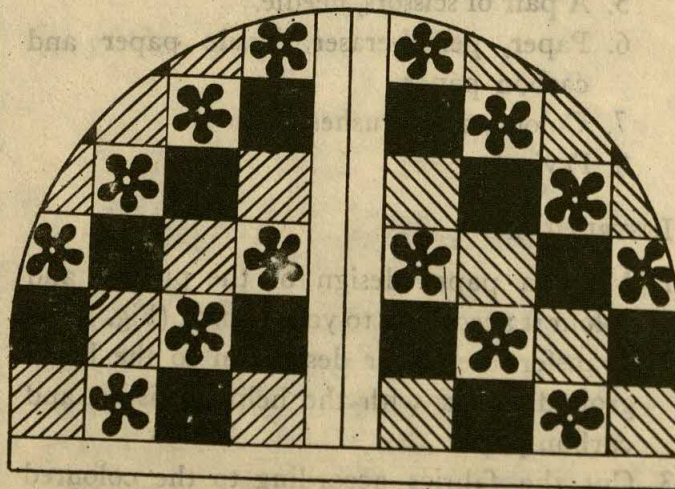


FIG. 1.3.5

use patchwork as well. But there is a difference between applique' and patchwork.

PATCHWORK

Patchwork is making something beautiful out of scraps of fabrics. This craft does not need special tools or involve the purchase of a lot of new materials. Patches are usually joined together using a fine oversewing stitch on the wrong side and as the stitches are not meant to be completely invisible, they must be neat and tidy. Start this craft using simple basic shapes, namely hexagon, triangle, square, pentagon etc.

IV. Macrame'

Macrame' is done with knots of varying combinations of a few basic knots which you can learn quite easily. Macrame' is exotic, and yet modern. Some macrame' designs are rather complex and require a bit of experience but you may start making macrame' design for the easiest things such as belts, purses, etc. Later

on you can take up others such as bags, vests, jewellery and wall hangings.

MATERIALS REQUIRED

1. Natural Cotton Cord about 3 mm. thick— white or coloured.

or

Nylon Cord or rug yarn.

2. Soft wooden board.
3. Nails or pins or some adhesive tape, for fastening the work to the board.
4. A buckle.
5. A pair of scissors.
6. Measuring tape.
7. Beads, etc.

INSTRUCTIONS

To make a 30 cm. long belt, you will need each thread or cord of 240 cm. long (8 times of the exact length).

1. First attach one part of the buckle to the board, using adhesive tape or a couple of nails hammered in at a slight inclination.

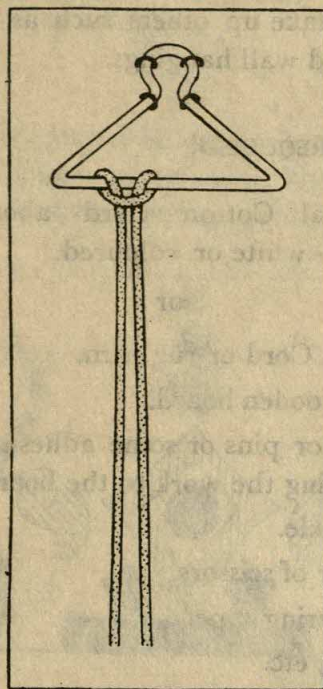


FIG. 1.4.1

2. Instead of using a buckle you can use holding cord. This process is called setting on threads. The holding cord is sometimes used as a part of the finished design, for instance, a handle for the bag. It can be withdrawn after knotting is complete.

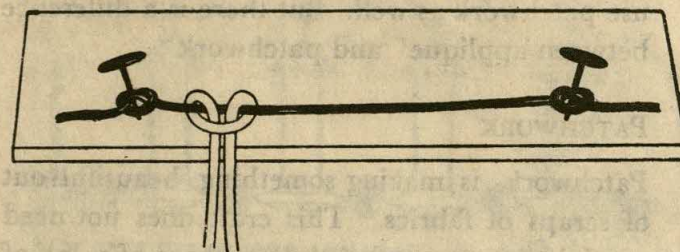


FIG. 1.4.2

3. Take a blue cord and make a knot as shown in the figure. Pull the knot tight. This is called hitching knot.

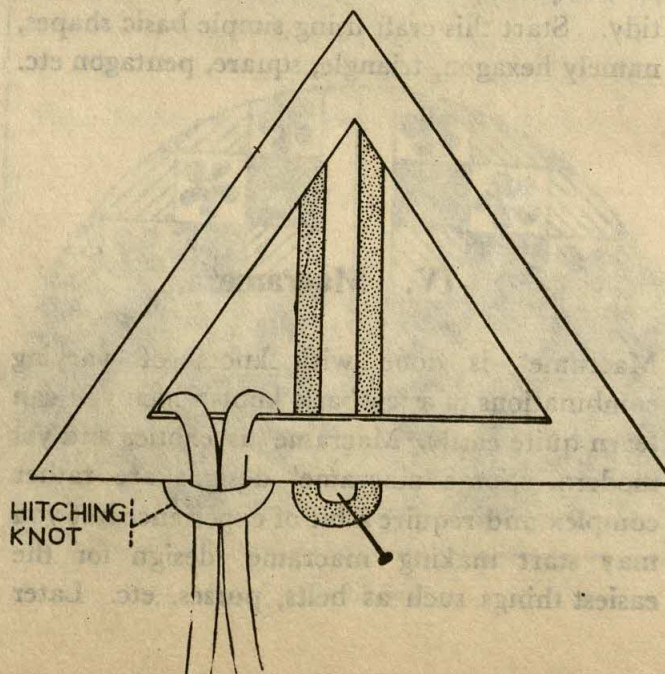
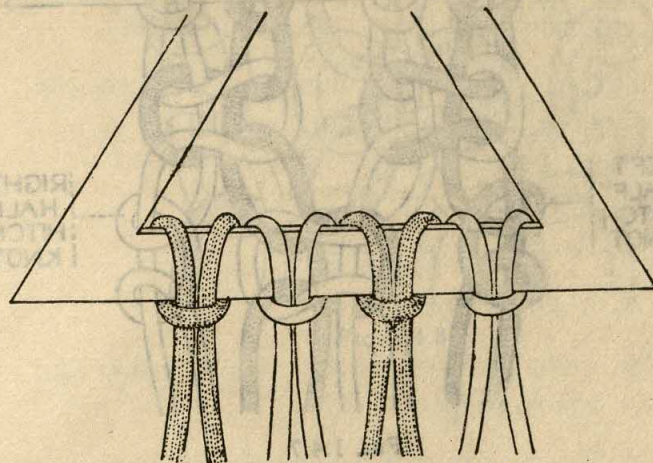
HITCHING
KNOT

FIG. 1.4.3

4. Make three more hitching knots with the remaining cords. You have now eight working cords as shown in the figure.



 BLUE CORDS
 RED CORDS

FIG. 1.4.4

5. First take the four cords on the left and make a square knot as shown in the figure.

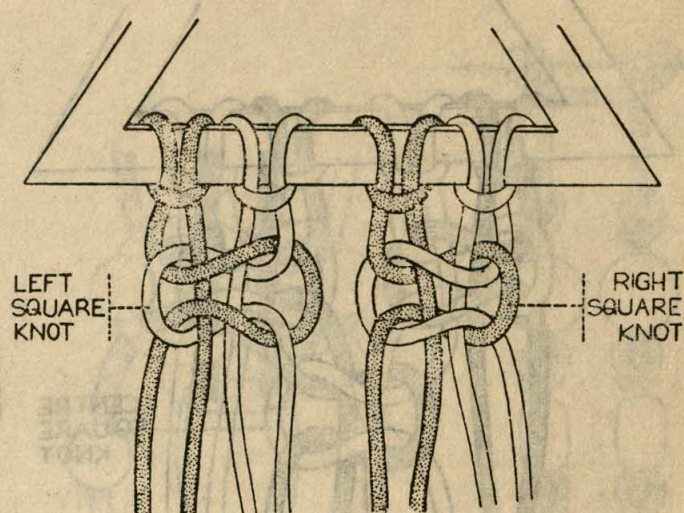


FIG. 1.4.5

6. Make a square knot on the right with the help of another four cords as shown in the figure.

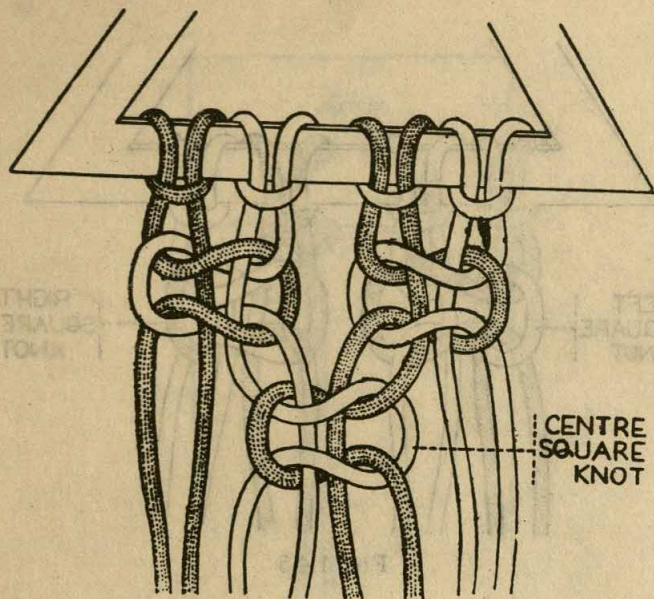


FIG. 1.4.6

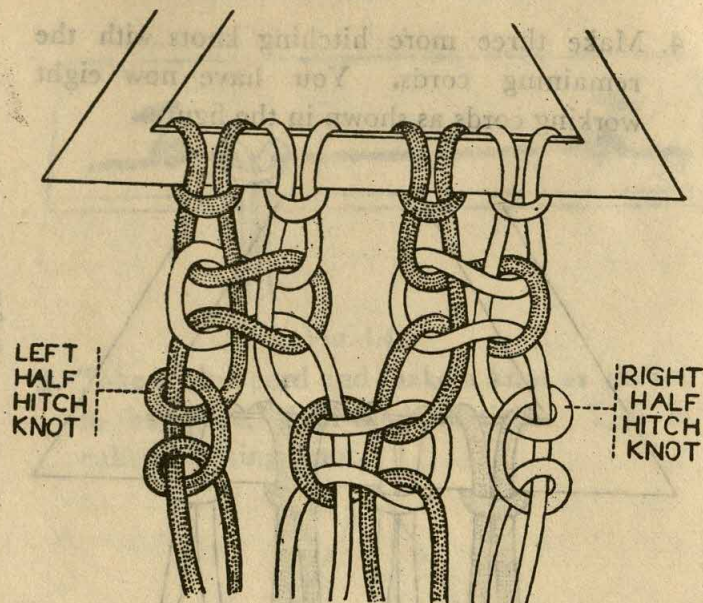


FIG. 1.4.7

7. Now make the centre square knot by using two cords each from the left and right knots as shown in the figure 1.4.6.
8. Take the first 2 cords of each knot and make two half hitch knots (Basic knots) on the right as well as left.
9. You have now completed one pattern of the belt. Repeat the pattern until the required length of the belt is made.
10. Wrap each cord around the buckle and tack it to place with needle and thread. Trim the ends.

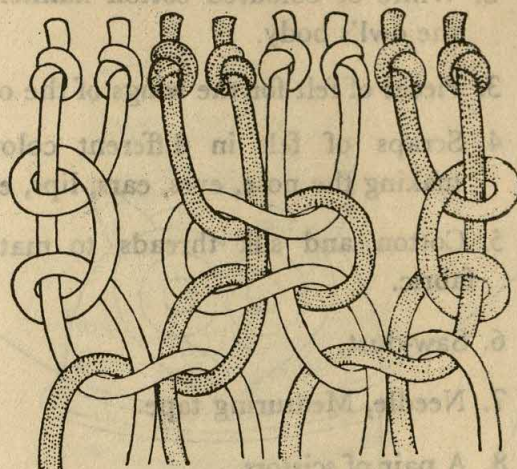


FIG. 1.4.8

This is the simplest method of making macrame' belt. You can string beads along with the cords and make it more attractive. Belts are a good project for building your skill in making knots. Afterwards, you will be able to make macrame' purse, shawls, bags and different types of hanging materials etc. Ask the students to make macrame' purses using beads or pearls of ordinary quality.

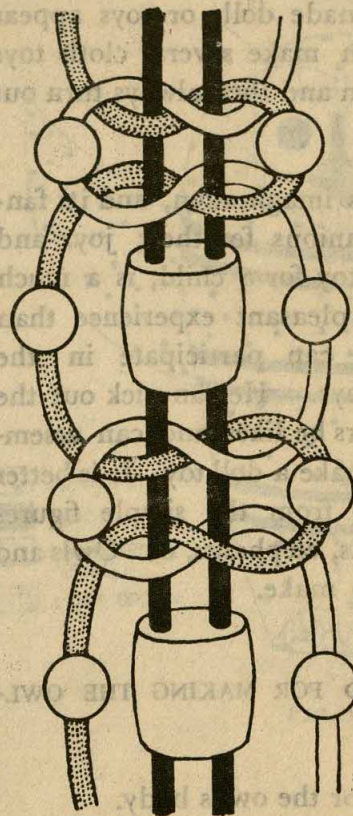


FIG. 1.4.9

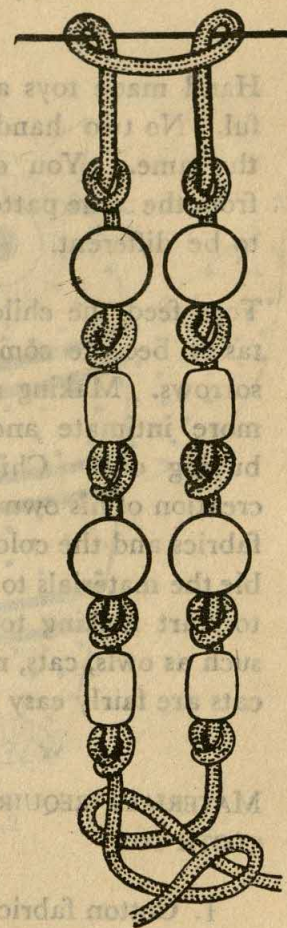


FIG. 1.4.10

V. Cloth Toys

Hand made toys are unique and look graceful. No two hand-made dolls or toys appear the same. You can make several cloth toys from the same pattern and they always turn out to be different.

Toys feed the child's imagination, and its fantasies become companions for their joys and sorrows. Making a toy for a child; is a much more intimate and pleasant experience than buying one. Child can participate in the creation of his own toys. He can pick out the fabrics and the colours he likes and can assemble the materials to make a doll toy. It is better to start making toys from the simple figures such as owls, cats, rats, elephants, etc. Owls and cats are fairly easy to make.

MATERIALS REQUIRED FOR MAKING THE OWL-CLOTH TOY

1. Cotton fabric for the owl's body.
(you can collect cotton fabric in different colours or prints of different textures.)

2. White or coloured cotton flannel to line the owl's body.
3. Pieces of felt for the wings of the owl.
4. Scraps of felt in different colours for making the nose, eyes, ears, lips, etc.
5. Cotton and silk threads to match the fabric.
6. Saw-dust.
7. Needle, Measuring tape.
8. A pair of scissors.
9. Pencil, eraser, paper, tracing paper and carbon paper.
10. Poster colour with brushes.
11. Fevicol.
12. Wooden base.

INSTRUCTIONS

1. Make the picture of an owl on the paper.

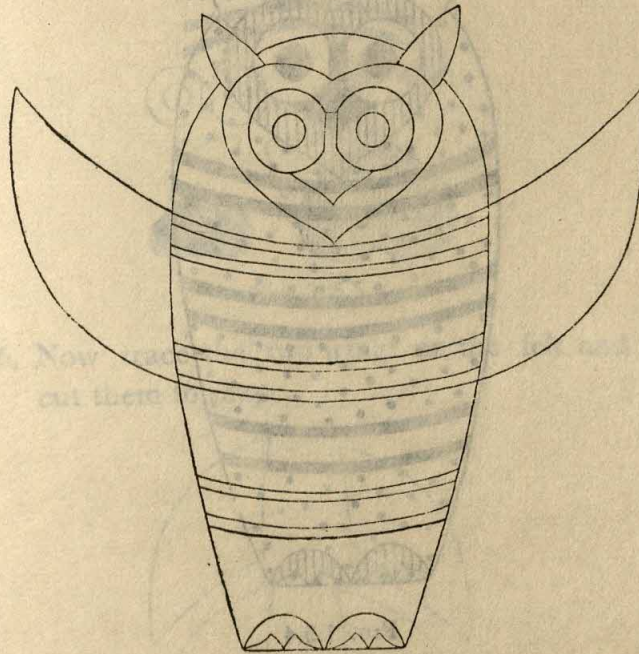


FIG. 1.5.1

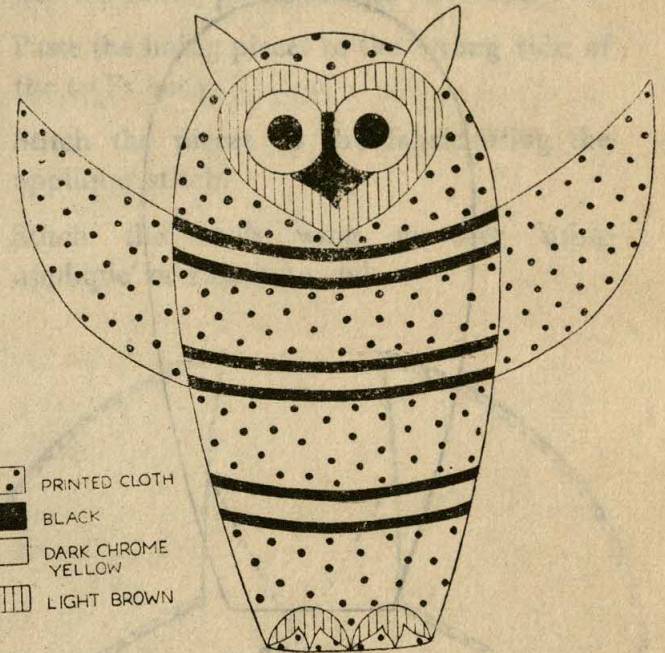


FIG. 1.5.2

-  PRINTED CLOTH
-  BLACK
-  DARK CHROME YELLOW
-  LIGHT BROWN

2. Colour it.

3. Trace the body on the cotton fabric using tracing paper and carbon paper separately.

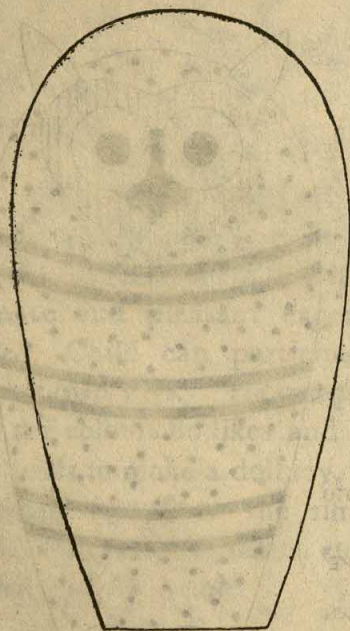


FIG. 1.5.3

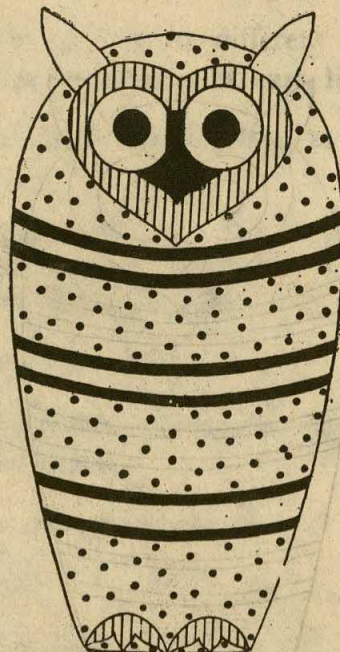


FIG. 1.5.4

4. Spread the front piece on the table and trace the nose, the eyes, ears, etc., according to the picture.
5. Trace the nose, eyes, ears, claws and other parts on the coloured cotton fabric according to the colour scheme and cut them.

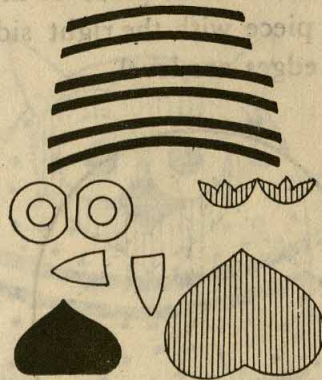


FIG. 1.5.5

6. Now trace the two wings on the felt and cut them to shape.

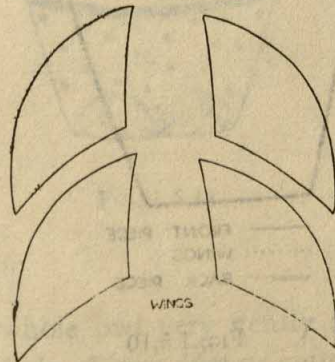


FIG. 1.5.6

7. Glue the beak, eyes, claws, nose, etc., one by one on the right place.

8. Allow sufficient time for glue to dry well.
9. Cut the lining pieces for the owl's body.
10. Paste the lining pieces to the wrong side of the owl's body.
11. Stitch the pieces to the fabric using the applique' stitch.
12. Stitch the owl's wing together using applique' or running stitch.

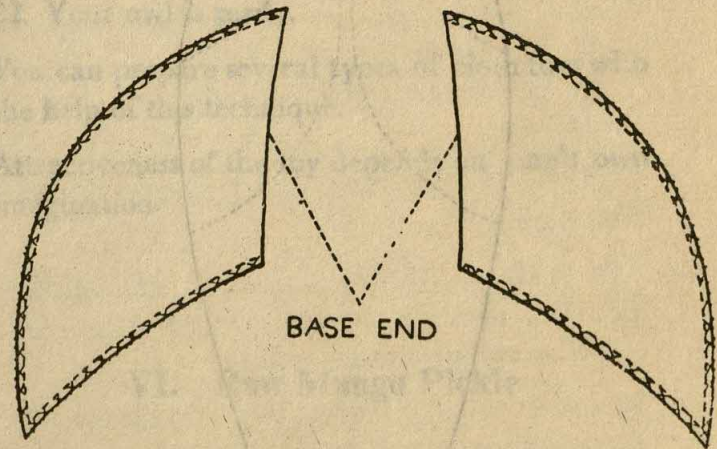
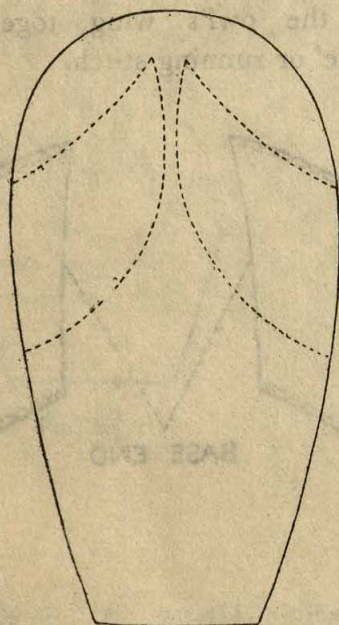


FIG. 1.5.7

FIG. 1.5.8

13. Leave the base end of the wings open and prepare two wings.

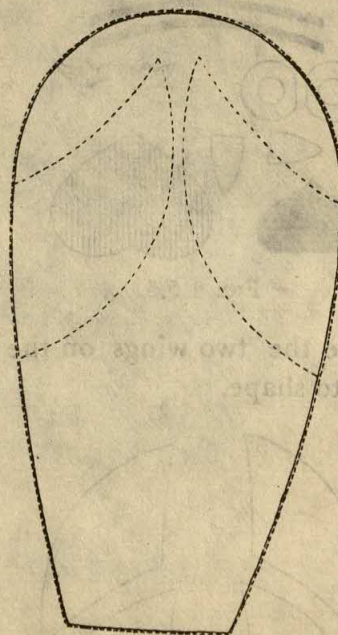
14. Pad each wing very gently and stitch the base end of the wings.
15. Place the back piece of the body with the right side facing upwards.
16. Then fix the padded wings in position with running stitches.



RIGHT SIDE

FIG. 1.5.9

17. Now place the front piece of the body over the back piece with the right side inside so that the edges are level.



— FRONT PIECE
 - - - WINGS
 - - - BACK PIECE

FIG. 1.5.10

18. Now stitch the edges all round leaving the base of the owl open for padding.

19. Turn the doll right side out and press.

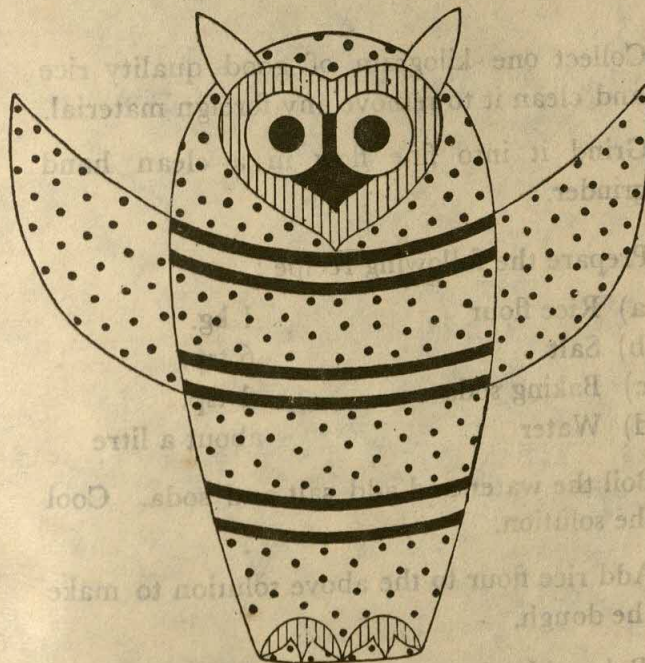


FIG. 1.5.11

20. Pad the whole owl very gently and neatly with the help of saw dust or cotton.

21. Stitch the ends of the owl's body. Fix the owl on a wooden base.

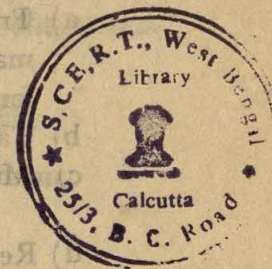


FIG. 1.5.12

22. Your owl is ready.

You can prepare several types of cloth toys with the help of this technique.

Attractiveness of the toy depends on one's own imagination.



VI. Raw Mango Pickle

1. Choose good green mangoes whose seeds have become tough. Mangoes nearing ripeness will not make good pickles.
2. Wash them in clean water and dry.

3. Cut the dried raw mangoes into pieces of desired size. Collect them in a dry, clean vessel. Prepare the following recipe :

- | | |
|---|-----------------------|
| a) Proper quality of mangoes suitable for pickles | 1 kg. |
| b) Table salt (dry) | 250 gms. |
| c) Mustard seed dals | 5 tablespoons (tbsp.) |
| d) Red chilli powder (according to taste) | 8 tbsp. |
| e) Turmeric powder | 4 tea spoon (tsp.) |
| f) Asafoetida | $\frac{1}{2}$ tsp. |
| g) Fenugreek seed dals | 1 tsp. |
| h) Oil | $\frac{1}{4}$ litre |

4. Shallow fry asafoetida and fenugreek seeds and pound it finely.
5. Mix chilli powder, dry salt, asafoetida powder, turmeric powder, fenugreek seeds powder and mustard seeds dal.
6. Mix it in the raw mango pieces by means of clean stainless steel spoon or wooden spoon.
7. Fill the pickle in sterilized bottles.
8. Prepare seasoning with oil and mustard seeds. Cool and add it to the pickle.

VII. Rice Papad

1. Collect one kilogram of good quality rice and clean it to remove any foreign material.
2. Grind it into fine flow in a clean hand grinder.
3. Prepare the following recipe :

a) Rice flour	1 kg.
b) Salt	6 tsp.
c) Baking soda	1 tsp.
d) Water	about a litre
4. Boil the water and add salt and soda. Cool the solution.
5. Add rice flour to the above solution to make the dough.
6. Bake this dough in steam in a cooker for about 10 minutes.
7. Take it out and knead it well.
8. Divide the dough into small balls and roll them on a clean smooth plank using a small quantity of rice flour if need be.
9. The papad is ready. Dry it in the sun and store it for use.

10. Make them into packets. Price them and sell with some profit.

You may prepare papad with exactly the same procedure by making use of black gram flour or green gram dal flour.

6. Cut the puries into small pieces by means of a kitchen knife.
7. Fry them in ghee till they are crisp.
8. Prepare thin sugar syrup and dip champakalies in the syrup.
9. Allow two minutes and remove them.
10. Use them for evening tea or sell them.

VIII. Champakali

1. Prepare the following recipe :

a) Maida	300 gms.
b) Sugar	500 gms.
c) Ghee	150 gms.
d) Baking powder	1 tsp.
e) Salt	1½ tsp.

2. Mix maida, salt and baking powder well.
3. Sieve the mixture through a fine sieve.
4. Add ghee, mix with water and make it into good dough.
5. Convert the dough into small balls and roll them into small puries.

IX. Potato Bonda

1. Choose good potatoes and wash them well in clean water to remove dust and other foreign material.
2. Collect also good onions, clean them and peel off the top skin.
3. Collect three or four good lemons.
4. Prepare the following recipe :

a) Potato	1 kg.
b) Mustard	10 gms.
c) Green chillies	25
d) Curry leaves	a small quantity

- e) Soda bi-carbonate about 5 gm.
- f) Onion 250 gms.
- g) Turmeric 5 gms.
- h) Lemons 3 or 4
- i) Besan 300 gms.
- j) Salt to the required taste.
- k) Oil of the required quantity for frying.

5. Boil the potatoes and peel off the skin. Mash it.

6. Chop ginger, onion and green chillies into small bits.

7. Take 25 gms of oil, mustard and some curry leaves and fry them. When mustard seeds crackle stop add the mashed potatoes and chopped ginger, onion, chillies, turmeric and salt. Mix them well.

8. Add lime juice and mix well removing the seeds.

9. Divide the mixture into small balls.

10. Prepare the besan batter of required consistency and add baking soda with small quantity of salt.

11. Dip the balls in the batter and deep fry in oil until the skin becomes brown.

12. Take them out and taste. With this simple procedure very delicious bondas can be prepared for yourself and your guests. If you choose you may add small quantity of leafy vegetables to improve the taste.

X. Vegetable Puffs

Prepare the following recipe :

Maida	300 gms.
Vegetable fat	100 gms.
Salt	according to taste
Rice flour	4 tsp.
Potato	300 gms.
Cauliflower	500 gms.
Peas	300 gms.
Onion	300 gms.
Coriander leaves	
Green chillies	
Turmeric	
Red chillies powder	

- Cardamom
cloves
lime
salt
fat to fry
2. Boil potatoes and cauliflower. Cut them into small pieces.
 3. Boil the peas and mash them.
 4. Chop the onions into fine pieces.
 5. Heat the fat in a pan. Add the chopped onions.
 6. When onion is light brown add masala, vegetables and salt.
 7. Cool and add lime juice.
 8. Now mix maida and salt.
 9. Rub one portion of fat in maida. Knead with water to a soft dough.
 10. Divide the dough into even portions and roll.
 11. Make a paste of rice flour and the remaining fat.
 12. Smear the rolled out dough with paste and roll.
 13. Cut these into one inch pieces.
 14. Press each piece vertically, roll into round shapes.
 15. Fill with vegetable mixture and fold over, forming a semicircle.
 16. Press the edges well.
 17. Deep fry till they look golden brown.

2

Electricity

OBJECTIVES

1. To develop an appreciation of the applicational aspects of electricity and its principles.
2. To develop the skill of rigging some common electrical circuits resulting in utility items.

1. Transformer

1. Prepare two coils A and B with 20 turns and 10 turns, respectively. The coils may be circular, rectangular, square or any shape. Connect them to a battery as shown in the figure. Keep them stationary.

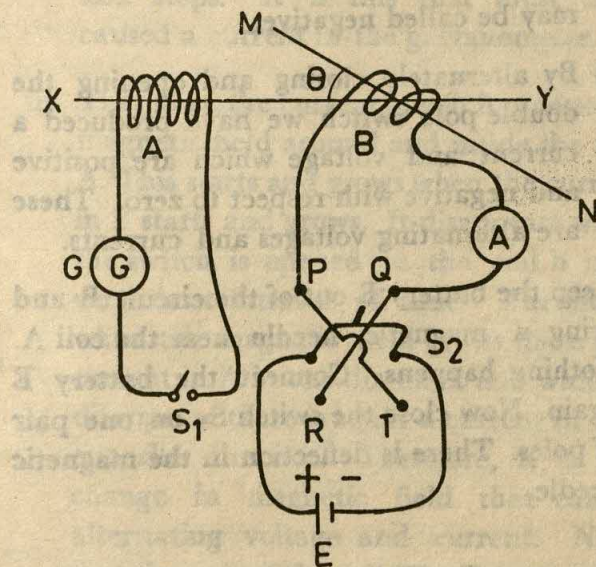


FIG. 2.1.1

2. Keep the switch S_1 closed. S_2 is a double-pole and double-throw switch. When this switch is not connected to the poles PQ or RT, there is no current in the circuit B. When

it is closed on one pair of poles say PQ, a current flows into it in one direction and it flows in the opposite direction when it is closed on the other pair RT. This means that the direction of the current is changed in the coil B by changing the position of the switch.

3. G in figure A is a galvanometer or a centre zero ammeter or voltmeter. Normally the point in this meter is on zero at the centre. Ask the students to observe a galvanometer.
4. Now close the switch S_2 on one pair of poles of the switch slowly and observe the behaviour in G. There will be some motion in the pointer. Open the switch slowly. Again some motion in the pointer is noticed. Again close the switch quickly. The reaction in G will now be violent. Open it quickly. The motion is again violent. But this motion is in the opposite direction to the previous one.
5. Open the switch and allow the pointer of G to come to rest. Close the switch on one pair of poles first and then on the other pair. The deflections clearly are in opposite direction. The faster the operation more violent are the deflections.

6. Note that there is no source of electrical energy in the circuit A. But still there is deflection in G. The deflection occurs only when there is a current. The current is possible only when there is voltage in the circuit. Since nothing except switching on and off in the second circuit took place, the voltage and current in it must have been caused by the operation of the switch S_2 . Switching on one set of poles and then on the other set will cause the current to change the direction. Therefore, this reversal of current must have been responsible for causing a voltage and a current in A.
7. Remove the battery E from the circuit B and repeat the experiment. Nothing happens in G. Now draw the following conclusions:
- When the switch S_2 is closed and opened on one pair of poles the galvanometer shows deflection in opposite directions.
 - Quicker the operation more violent is the deflection.
 - When the switch is closed and opened alternately on the two pairs of poles the deflections are in opposite directions.

The value of deflection in one direction is nearly equal to that in the other direction if closing and opening the switch are quickly done.

- If we call the deflection to the right of 'zero' as positive, the deflection to the left may be called negative.
 - By alternately closing and opening the double pole switch we have produced a current and voltage which are positive and negative with respect to zero. These are alternating voltages and currents.
8. Keep the battery E out of the circuit B and bring a magnetic needle near the coil A. Nothing happens. Connect the battery E again. Now close the switch S_1 on one pair of poles. There is deflection in the magnetic needle.
9. Now open S_2 . The magnetic needle oscillates for a time and settles down to magnetic north and south. Draw the following conclusions:
- There is no physical connection between A & B. Therefore, current from circuit B cannot flow into A.

ii. When the current flows in B you know there is a magnetic field all round A and B. This field exists only when the current flows in B. Therefore, it must be the magnetic field which appears and disappears in A when the current in B flows and stops. It is this that must have caused a current in the galvanometer.

iii. Therefore, the current in coil B produces a magnetic field around and inside the coil A. This starts and grows when the current in B starts and grows. It disappears when the switch is opened in the coil B in a very short interval of time. Therefore, when the magnetic field grows there is a current in A in one direction and while it disappears there is again a current in the opposite direction. Therefore, it is the change in magnetic field that causes alternating voltage and current. Note that the axis of the coil A makes an angle θ with that of B.

10. Turn the coil B slowly such that MN coincides with XY. Repeat the above experiment. The deflection now will be more.

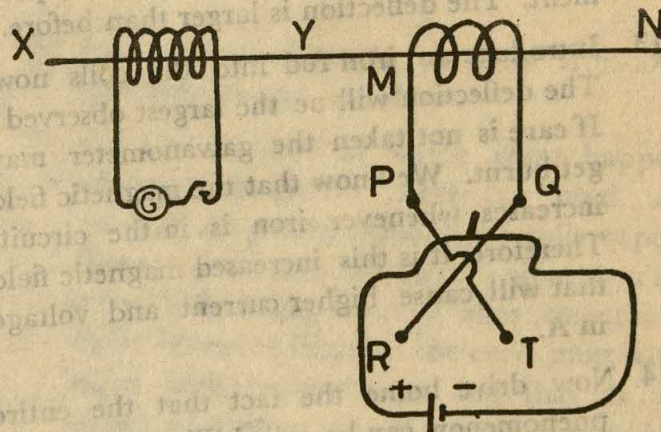


FIG. 2.1.2

11. Turn the coil further such that the plane of the coil B becomes perpendicular to the plane of A. Repeat the experiment. Nothing happens in G. Draw the conclusion :

- When the planes are mutually perpendicular no current is caused in A generally.
- In any other position there is deflection in the galvanometer. It is maximum when the planes are parallel to each other and their axes are collinear.

12. Make the two coils come closer. Repeat the experiment. The deflection increases further.

Now place one coil inside the other with their axis coincident and repeat the experiment. The deflection is larger than before.

13. Introduce an iron rod into the coils now. The deflection will be the largest observed ! If care is not taken the galvanometer may get burnt. We know that the magnetic field increases whenever iron is in the circuit. Therefore, it is this increased magnetic field that will cause higher current and voltage in A.

14. Now drive home the fact that the entire phenomenon can be called 'Electromagnetic Induction' and it always takes place whenever a current changes in one of these circuits. When the current in one changes its magnetic field also changes. The phenomenon is electric as well as magnetic in nature and is, what is generally called as 'Transformer action'. The circuit in which the current is made to change is called the 'Primary'. The circuit in which current is induced is called the 'Secondary'. We can transfer electrical energy from one coil to the other in this way without directly connecting one coil to the other.

If the switching on and off is performed in quick succession the change in the current in the coil A will be smooth but will be positive and negative with respect to zero.

II. Construction of a Transformer

1. In the activities given above an iron rod was introduced into the co-axial coils. Instead, if we introduce non-magnetic rods such as of glass, wood, bakelite or porcelain, the magnetic field does not get affected. The field variations will be more or less the same as would be in their absence. Conduct the test to make this clear to the students.
2. Introduce an ammeter into the circuit B. By closing the switch S_2 adjust the current to 0.25 ampere (A). Open and close the switch as quickly as possible. Note the deflection in the centre zero meter.
3. Increase the current to 0.5 A. Repeat the test. Draw the attention of the students to the magnitude of deflection now. It will be nearly double the previous value. Repeat this for 0.75 and 1 ampere. The deflection will be three times and four times the first.

Draw the conclusion that induction in the coil A is directly proportional to the current interrupted in B. Such coils are needed in many measuring and controlling circuits. These are called the 'linear inductors' or 'transformers'.

4. Ask the students to construct linear transformers by choosing the available wires and non-magnetic cores (rods).
5. Now re-introduce iron or steel rod and repeat the experiment. Now the deflection in the galvanometer will not be proportional to the current always. It will be found to be proportional to smaller values of current in B but not for higher values. The magnitude of deflection in each case will be high and therefore the galvanometer should be protected from high currents.

The transformers so prepared are called iron-cored transformers. These are the most common types of transformers used for a variety of purposes. They are used in the radios, for night-lamps, refrigerators and a variety of instruments. Their sizes can be as small as our thumb and may be very big weighing several tonnes.

6. Ask the students to prepare iron-cored transformers and test them.
7. Ask the students to watch what happens when non-magnetic cores are used and currents are passed through the coils especially when the coils are directly wound on the cores. They begin burning after sometime! Drive home the fact that the cores must withstand high temperatures and that is the reason why porcelain or ceramic materials are used.
8. Also make them realise that the wires used must be insulated; otherwise there will be short-circuit. Tell them the neat transformers that are found in radios also work on the same principle.

III. Transformers on Alternating Current Circuit

1. Switching the circuit on and off involves manual labour. Further the variation of current and voltage are not smooth. Instead of this we may use the voltage generated by an alternating current generator. (It is assumed that simple ideas about the working of generators will have been taught in

Physics. If it has not been taught the teacher may discuss its construction and its working. Generally the voltages that are available at the residences is 220 to 240 volts. For the school work these voltage sources should be adequate. Appropriate precautions should be taken to watch the students when they work with 220 volts supply source.)

2. Choose a steel rod of 2 cm diameter. Make use of enamelled copper wire, and wind, say 200 turns on the rod. Since the rod provides the mechanical support and causes high magnetic field, it can induce comparatively high voltage in other coils put on the same rod. In putting the winding on the rod take adequate care to see that the wires are close together but not irregularly one above other. Put 100 turns in the second coil. This coil may be wound either by the side of the first coil or on it. If you like to put one over the other then use one layer of stiff paper over the first and then wind the second coil. Give reasons for putting this paper. Choose the wire of gauge 30 or 32. Now connect the coil Y to the voltage source available in the school with a suitable ammeter (0–5A) to measure the current. In the second circuit

connect a voltmeter (0–250V) to measure the voltage in it.

3. The volt-meter in the second coil X now shows a deflection if the switch is put on.

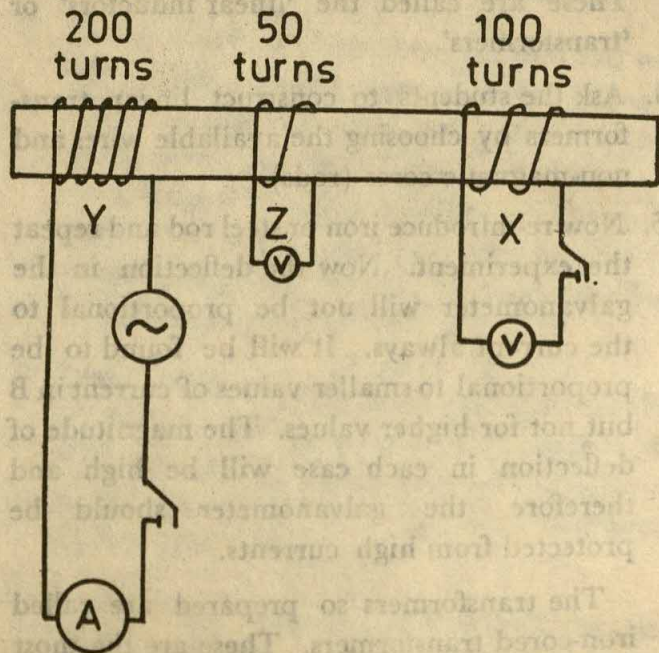


FIG. 2.3.1

4. Measure the voltage across circuit Y. You will notice that the first shows approximately 220 volts and the second approximately 110 volts.

5. Now put one more winding Z with 50 turns of wire of gauge 36 or 40. Repeat the experiment. The volt-meter now will indicate about 55 volts. If we had put 400 turns instead of 50 we would have measured 440 volts probably. Ask the students to prepare a coil with 400 turns and experiment. In the previous case the voltage was one half of 110 volts observed. In the second case it will be four times 110 volts ! Now draw the following conclusions:
 - i. The induced voltage in X depends upon the number of turns on it. If the number of turns increases the induced voltage also increases. It decreases if the number of turns decreases.
 - ii. The increase or decrease of voltage is directly proportional to the number of turns.
 - iii. Define that the ratio of turns in the primary and the secondary as 'turns ratio' or approximately 'voltage ratio'. The two are nearly equal.
6. In all these cases the temperature of the winding rises because of the alternating current in the coils or winding even when a heat insulator is put between the wind-

ing and the steel rod. Usually the temperature of the coil should not exceed about 120°C . Otherwise the winding becomes soft and begins melting as the temperature goes on increasing. This fact should be carefully discussed with the students.

7. Now connect a rheostat to make the current flowing in Y increase or decrease and include an ammeter in the circuit X. Start the experiment with the full resistance in the circuit. Ask the students to adjust the current in A_1 by using the rider on the rheostat. The current in A_2 is always nearly double the current in A_1 . Now change the connection to the coil with 400 turns. Repeat the experiment. Now the current in the coil will be one half of the current in Y.

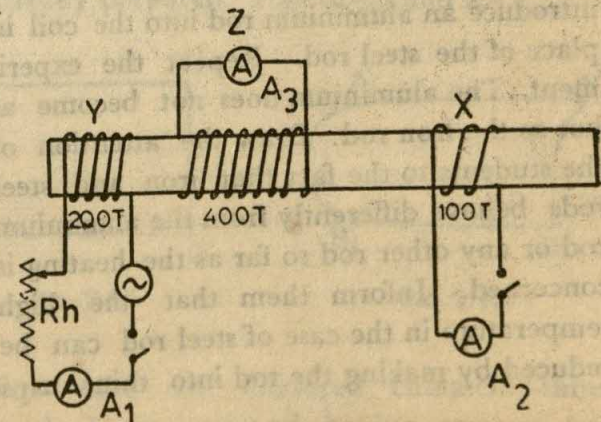


FIG. 2.3.2

Now draw the conclusion:

- i. When the number of turns in X (secondary) is less, the current in it is more and when the number of turns is more the current is less.
- ii. The behaviour of currents is exactly opposite to that of the voltages.
- iii. If the voltage ratio is nearly 2 the corresponding current ratio is $\frac{1}{2}$.
- iv. The product of voltage and current in X equals the product of current and voltage in Y.

Notice that the temperature of the steel core rises continuously. It may become very hot if precaution is not taken.

Disconnect the supply to the primary and introduce an aluminium rod into the coil in place of the steel rod. Repeat the experiment. The aluminium does not become as hot as the iron rod. Draw the attention of the students to the fact that iron and steel rods behave differently from the aluminium rod or any other rod so far as the heating is concerned. Inform them that the high temperature in the case of steel rod can be reduced by making the rod into thin strips

and put one by the side of the other by interposing some thin paper between one strip and another strip.

10. Now collect a transformer from any radio and show how the transformer core is built and how the windings have been put. Draw the attention of the students to the fact that this core is made of thin steel strips or laminations arranged in a particular way. Construct a transformer and ask the students to construct their own transformers.

IV. A Room-Heater

1. Cut a 32 cm $\times$ 30 cm sheet out of an old tin container. Flatten it by using a wooden mallet.

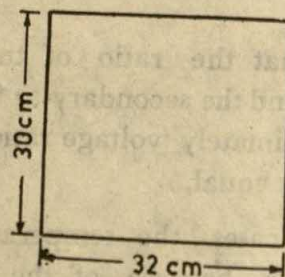


FIG. 2.4.1

2. Take a 0.5 cm thick mild-steel bar and a mallet. Place the bar on the sheet at a distance of 1 cm parallel to the edge AC. Fold edge of the sheet on the bar as shown in Fig. 2.4.2 by using the mallet. Repeat the process on the other side also.

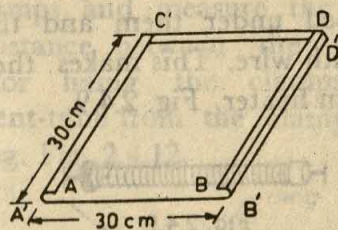


FIG. 2.4.2

3. Now bend the sheet $A'B'C'D'$ as shown in the diagram Fig. 2.4.3 by using a cylindrical wooden block and a mallet.

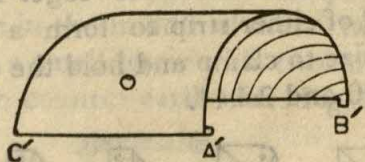


FIG. 2.4.3

4. Fix a handle at a distance of about 4 cm from one of the bent edges as shown in Fig. 2.4.4. Drill a hole at the centre of this cover

to fix a hard-rubber or bakelite bush for taking the power-cord out.

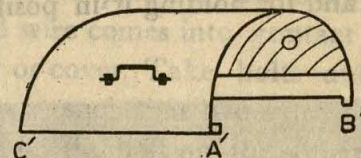


FIG. 2.4.4

5. Take an aluminium sheet 30 cm $\times$ 20 cm and 0.15 or 0.2 cm thick for making a reflector. Bend it gently by applying equal force on edges A_1C_1 and B_1D_1 such that the direct distance between the two ends A_1 and B_1 is the same as in case of the cover already prepared. Figs. 2.4.5 and 2.4.6.

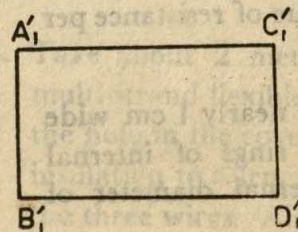


FIG. 2.4.5

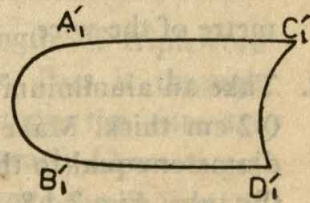


FIG. 2.4.6

6. Now take an unglazed china-clay-tube nearly 20 cm long and having grooves for

winding Nichrome wire of gauge 32. Such a tube is easily available in the market. It has two small holes on either end to take the wire out and for holding it in position. Fig. 2.4.7.

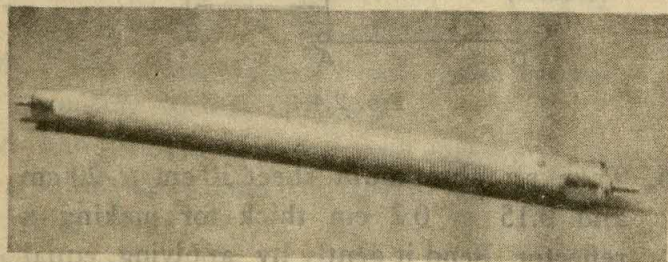


FIG. 2.4.7

7. Ask the students to calculate the length of the Nichrome wire required as they did earlier. Give them the value of resistance per metre of the wire.
8. Take an aluminium strip nearly 1 cm wide 0.2 cm thick. Make two rings of internal diameter equal to the external diameter of the tube. Fig. 2.4.8.

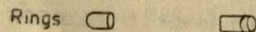


FIG. 2.4.8

9. Ask them to wind Nichrome wire of the required length over this tube. See that the wire rests in the grooves. Show the students how the wire is held in position by taking the end out of the small holes. Slip the aluminium rings on either end of the china clay tube such that they keep the ends of the wire pressed under them and they make contact with wire. This makes the element of the room heater. Fig. 2.4.9.

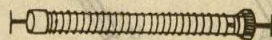


FIG. 2.4.9

10. Take two mild-steel strips $1\frac{1}{2}$ cm wide and 8 cm long and drill holes on one end of these allowing a margin of at least $\frac{1}{2}$ cm from the edge. Bend the strips at right angles at a distance of 1.5 cm from the edge. Bend the other end of either strip to form a ring of suitable size to clamp and hold the element. Fig. 2.4.10 and 2.4.11.

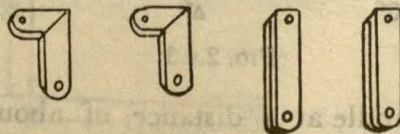


FIG. 2.4.10



Rings

FIG. 2.4.11

11. Put the conducting ends of the element in these clamps and measure the centre to centre distance between the two holes meant for fixing the clamps. Remove the element-tube from the clamps for the time-being. Fig. 2.4.12.



FIG. 2.4.12

12. Drill two holes on the horizontal middle line of the reflector at a distance equal to the length measured above by using a suitable drill bit for fixing the clamps. Drill a third hole in the middle of these two holes for fixing a small screw with two nuts and washers to connect earth-wire. Fig. 2.4.13.

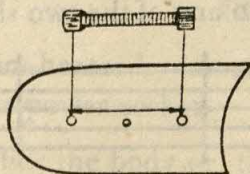


FIG. 2.4.13

13. Fix the clamps to the reflector. Use porcelain washers/bush and cleats to fix the two clamps such that no part of the clamps, screw, nuts and wire comes into contact with the reflector or cover. Take bolts and nuts of suitable size such that two extra nuts can be provided on the bolt on the other side for connecting the powercord. Figs 2.4.14 and 2.4.15.

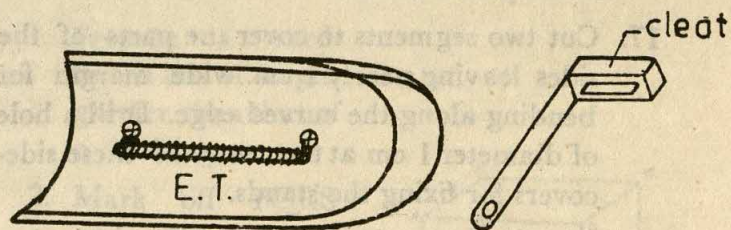


FIG. 2.4.14

FIG. 2.4.15

14. Take about 2 metre length of triple-core multi-strand flexible cable. Pass it through the hole in the cover. Remove the external insulation to a length of nearly 12 cm to get the three wires. Also remove the rubber of P. V. C insulation of these three wires and twist the strands of each wire separately.
15. Take some porcelain beads and slip these beads over the entire naked lengths of these

wires. Connect the ends of the wires with red and black insulation to the terminals of the clamps by pressing the hooked ends between the two nuts. Connect the third wire with green insulation to the terminal.

- 16 Slip the reflector in the U shaped channels of the cover and pull out the extra length of the cable enclosed between the cover and the reflector gently. Connect a three-pin plug to the power cord.
17. Cut two segments to cover the parts of the sides leaving nearly 1 cm. wide margin for bending along the curved edge. Drill a hole of diameter 1 cm at the centre of these side-covers for fixing the stands.
18. Cut the 1 cm wide margin at 3 or 4 points and bend it over the curved edge. Rivet these covers to either side. Fig. 2.4.16

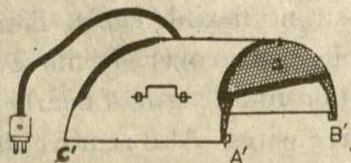


FIG. 2.4.16

19. Bend two rods of equal length (nearly 30 cm. long) and diameter 0.6 cm to make two

stands of V shape as shown in Fig. 2.4.17. Flatten the closed end to bore a hole. Use a bolt with nuts and washers on either side of the side cover to fix these stands to the cover. Put some hard rubber covers at the ends of the four legs.



FIG. 2.4.17

20. Replace the element tube in the clamps making sure of the proper contact.
21. Take five pieces of mild steel wire of diameter 0.3 cm. and 40 cm in length. Also take two pieces of the same wire equal to the perpendicular distance between the two edges of the side cover.
22. Put the five longer pieces of wires horizontally and parallel to each other at equal distances as shown in Fig. 2.4.18. The total distance between the first and fifth wire should be equal to any of the two shorter wires.

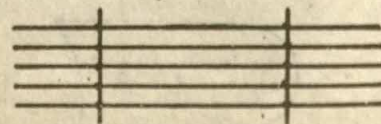


FIG. 2.4.18

23. Place the two shorter wires as shown in Fig. 2.4.19 leaving a distance of 5 cm on either side and get them brazed.

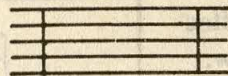


FIG. 2.4.19

24. Bend 5 cm. length of wires on either side at right angles Fig. 2.4.20. Fix this guarding cage to the front of the room-heater in such a way that the 5 cm long bent wire on either side rests on one side or the other side of side cover. The room-heater is ready for use (Fig. 2.4.21)

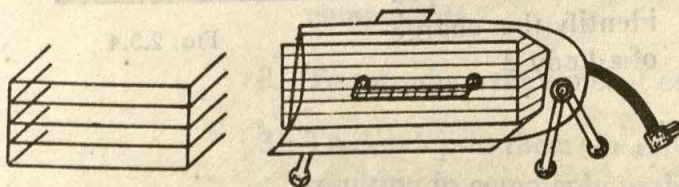


FIG. 2.4.20

Room heater

FIG. 2.4.21

25. Test the room-heater by inserting the three-pin plug in a power socket.
26. Make sure that the body or the cover has been earthed properly. No part of the bare

wire should touch the conducting body. Porcelain beads and cleats must be used wherever necessary.

V. Straw Electroscope

1. Prepare a cardboard box of length greater than that of a drinking straw.
2. Mark off PQRS and MNOP on front and back faces as shown in the figure 2.5.1.
3. Cut off the portions ABQP, SRCD, FGNM and OHEL.
4. Make V shaped cuts on each strip about $1/2$ cm away from their centres O and O' (Fig. 2.5.2)

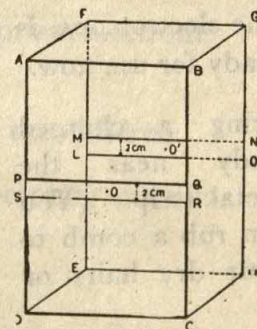


FIG. 2.5.1

5. Pass a darning needle through a straw about 0.2 cm away from its centre. Suspend the arrangement on the V-cuts as shown (Fig. 2.5.3.).

6. Through the top face of the box pass a metal strip (preferably aluminium) about 1/2 cm away from the centre X. (Fig. 2.5.4)

7. The electroscope is ready for use now.

8. Bring a charged body near the metal strip. (You can rub a comb to your dry hairs or

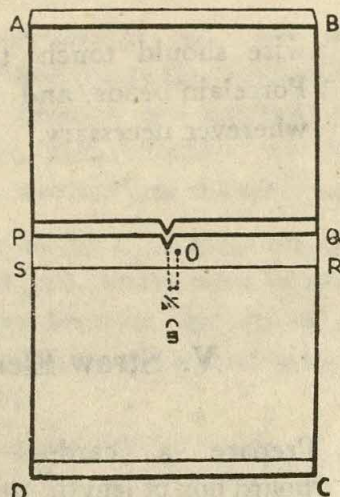


FIG. 2.5.2

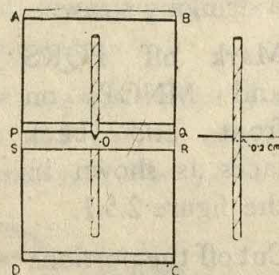


FIG. 2.5.3

throw-away polythene bag with your dry clothes for this purpose). Notice the deflection in the straw.

9. Try to charge the electroscope as well (Better results are obtained if the straw carries the silver/aluminium paint). With the help of your charged electroscope can you identify the charge of a body?

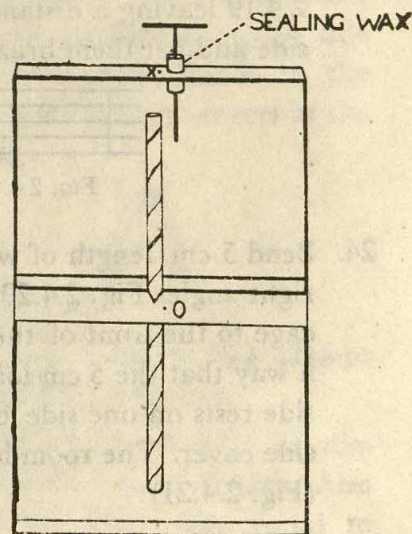
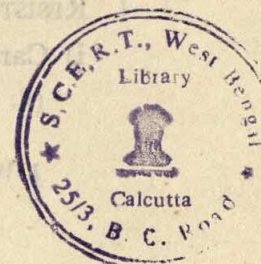


FIG. 2.5.4

3

Electronics

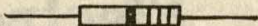
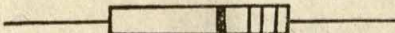
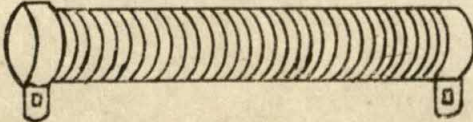


OBJECTIVES

1. To develop the skill of identifying and selecting appropriate electronic components.
2. To introduce the concept of semiconductor technology to the children.
3. To develop in them the skill of rigging some simple electronic circuits resulting in commonly usable appliances.

I. Some Components

Let students know, observe and examine these components :

Name	Figure	Symbols
1. RESISTORS		
i) Carbon resistors		
(F. 1, F. 2) S. 1		
$\frac{1}{2}$ WATT	F.1  FIG. 3.1.1	S.1 Resistance  FIG. 3.1.1a
1 WATT	F.2 Resistor  FIG. 3.1.2	
ii) Wire-wound resistor		
(F. 3) S.2		
	F.3 Wire wound resistor  FIG. 3.1.3	

Name

Figure

Symbols

2. VARIABLE RESISTORS OR VOLUME CONTROL

(F. 4, F. 5)

F.4

) Carbon

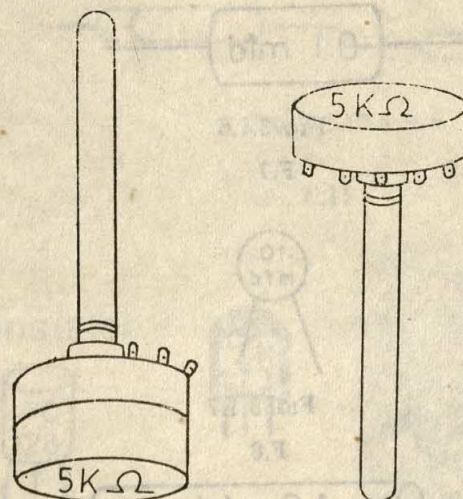


FIG. 3.1.4

F.5

S.2

Wire-wound

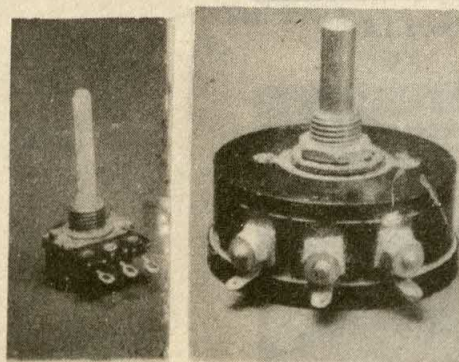


FIG. 3.1.5a,b

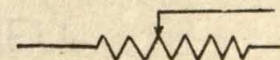
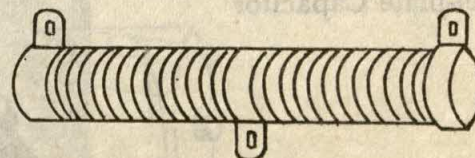
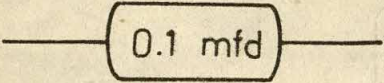
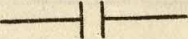
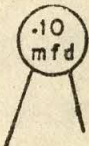
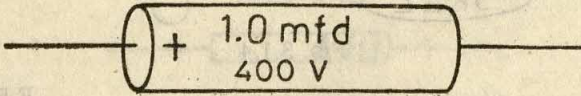
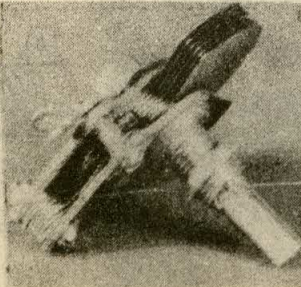
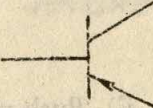
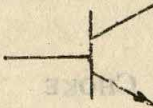
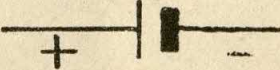
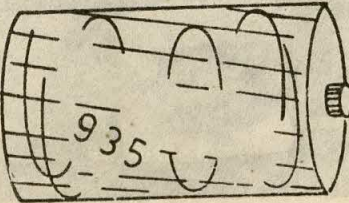
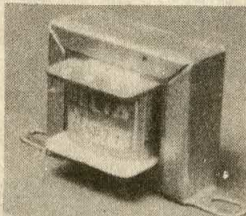
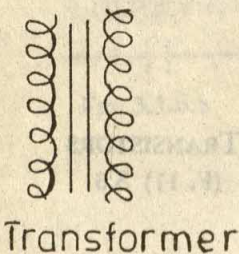
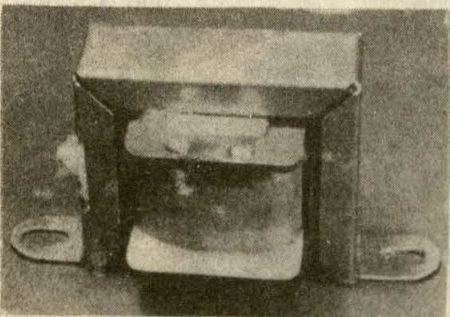
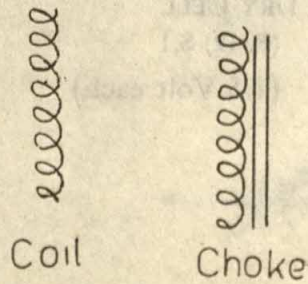


FIG. 3.1.5c

Name	Figure	Symbols
3. CAPACITORS (F. 6 to F. 9) S.3, 4	F.6	S.3
i) Paper Capacitor		Capacitance 
	FIG. 3.1.6	FIG. 3.1.6.a
ii) Ceramic Capacitor	F.7	
		
	FIG. 3.1.7	
iii) Electrolytic	F.8	
		
	FIG. 3.1.8	
iv) Gang or Variable Parallel-plate Capacitor	F.9	S.4
		
	FIG. 3.1.9	FIG. 3.1.9.a

Name	Figure	Symbols
4. DIODES (F. 10) S.5	F.10	S.5 Diode  FIG. 3.1.10c
5. TRANSISTORS (F. 11) S.6	FIG. 3.1.10 a & b	
Transistor	F.11	S.6 PNP  NPN  FIG. 3.1.11b
 FIG. 3.1.11	 FIG. 3.1.11.a	
6. DRY CELL (F. 12) S.1 (1.5 Volt each)	F.12	S.7 CELL  FIG. 3.1.12 a
	 FIG. 3.1.12	

Name	Figure	Symbols
7. TRANSFORMERS		
(FIG. 3.1.13) S.8		S.8
i) Out-put transformer		 Transformer
	FIG. 3.1.13	FIG. 3.1.13 a
ii) Push-pull type transformer		
8. CHOKE		
(FIG. 3.1.14) S.9		S.9
		 Coil Choke
	FIG. 3.1.14	FIG. 3.1.14a

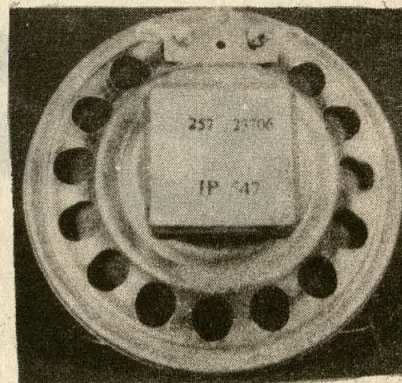
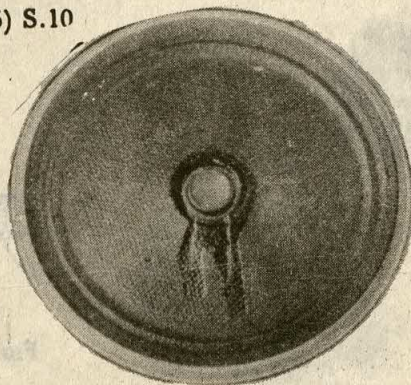
Name

Figure

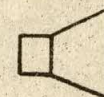
Symbols

9. SPEAKER

(FIG. 3.1.15) S.10



S.10



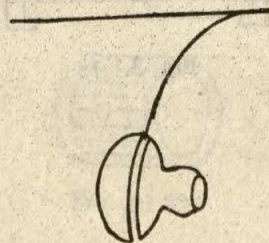
Speaker

FIG. 3.1.15

FIG. 3.1.15 a

10. EAR-PHONE

(FIG. 3.1.16) S.11



S.11

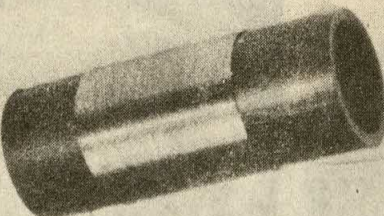
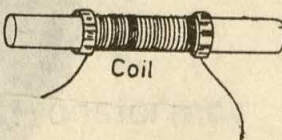
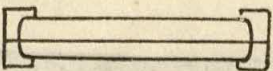


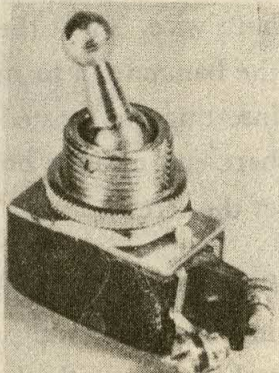
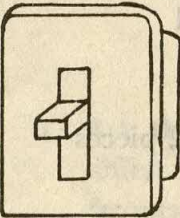
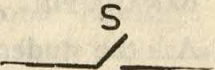
Ear phone

Ear-Phone

FIG. 3.1.16

FIG. 3.1.16 a

Name	Figure	Symbols
11. COILS (FIG. 3.1.17) S.12 (Inductors)		S.12
	FIG. 3.1.17	
		FIG. 3.1.17 a
12. FUSE-CARTRIDGE (FIG. 3.1.18) S.13		S.13
	FIG. 3.1.18	
		FIG. 3.1.18 a
13. HOOK-UP-WIRE (FIG. 3.1.19)		
	FIG. 3.1.19	

Name	Figure	Symbols
14. TOGGLE SWITCH AND SLIDE SWITCH (Figs. 3.1.20, 21) S.14	 FIG. 3.1.20	 Slide switch FIG. 3.1.21 S.14 Switch  FIG. 3.1.20 a

15. KNOBS

(FIG. 3.1.22)

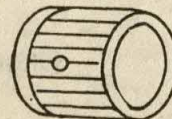


FIG. 3.1.22

II. Preparation of banana-pin and crocodile-clip leads

1. COLLECT THE FOLLOWING MATERIALS

- | | |
|---|----------|
| i) Banana-plugs | 3 |
| ii) Crocodile-clip | 1 |
| iii) P. V. C. insulated multistrand flexible wire | 2 pieces |

2. BANANA-PIN

Ask the students to examine a banana-pin. Usually, it has a metallic pin screwed in a plastic tube as shown in Fig. 3.2.1

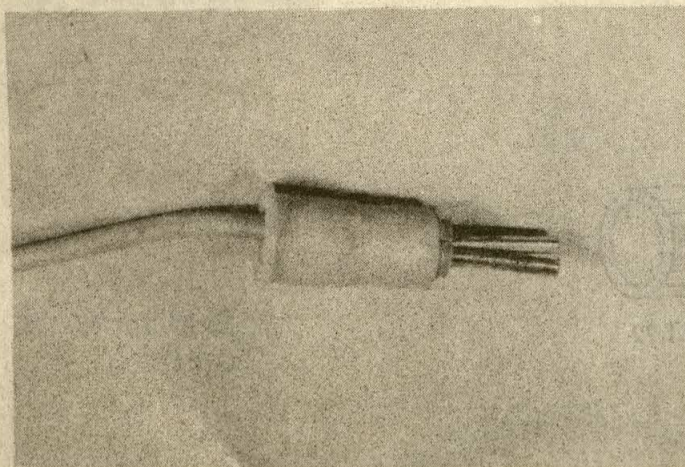


FIG. 3.2.1

3. Take a piece of multistrand flexible P. V. C. insulated wire nearly 50 cm long and scrape the two ends to get about 1/2 cm length of bare wire. Twist the ends. Slightly unscrew the banana-pin to make the hole clear for inserting the twisted bare end. Insert the bare end into the hole and press it by means of the screw.
4. Some banana-pins have no screws for holding the wire and you have to solder the naked ends in the holes of the pins. Connect a banana-pin to the other end of the wire in the same way. The lead with banana-pins at either end is ready for use.

CROCODILE-CLIP

5. Ask the students to examine a crocodile-clip also. Ask them to press the ends to note how a crocodile-clip opens its mouth by spring action for holding wire. Usually the ends for pressing are P. V. C. insulated. Fig. 3.2.2

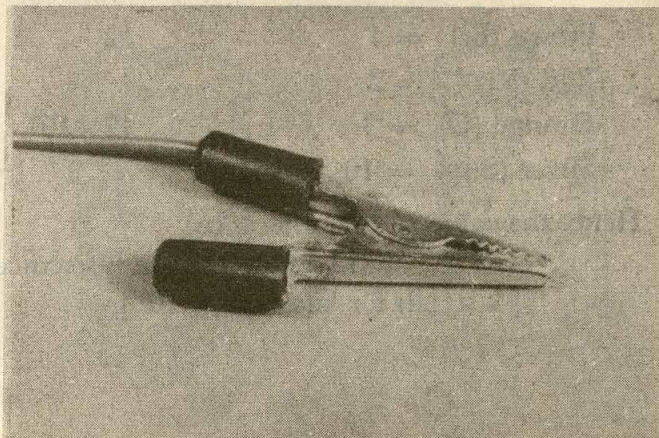
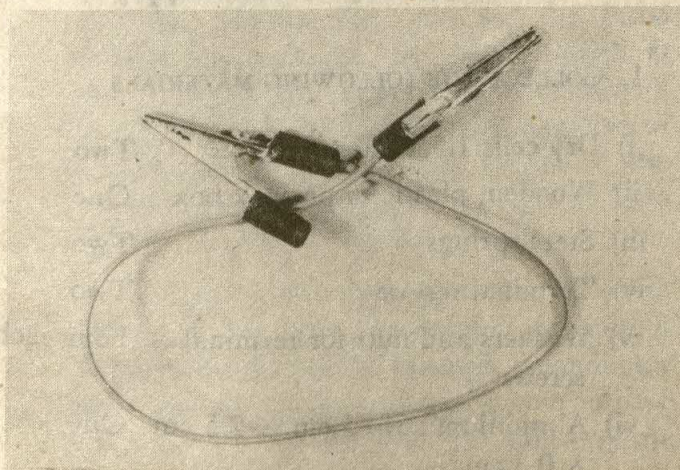


FIG. 3.2.2

6. Instead of a banana-pin connect a crocodile-clip if desired as shown in Fig. 3.2.3



7. Such leads are frequently used for testing and repair work of electronic-circuits. These are also used for trying out a circuit.

III. Carbon Resistors

1. Ask the students to observe and examine different types of carbon resistors which are frequently used in electronic industry. On some resistors you will find their values written but on others you find only the colour bands. You can know their values according to the following colour-code.

COLOUR-CODE

Black	...	0
Brown	...	1
Red	...	2
Orange	...	3
Yellow	...	4
Green	...	5
Blue	...	6
Violet	...	7
Grey	...	8
White	...	9

Golden	5 % tolerance
Silver	10 %

2. The colour of the first band gives you the digit of the tens while the colour of the second band gives the number of the units. You get the power of 10 by means of the colour of the third band and this becomes the multiplying factor of the two digit number got earlier. The fourth band which is either golden or silver gives you the tolerance of the resistor whether the value is correct up to $\pm 5\%$ or $\pm 10\%$.

EXAMPLE

Read the value of a carbon resistance by using colour code. Fig. 3.3.1

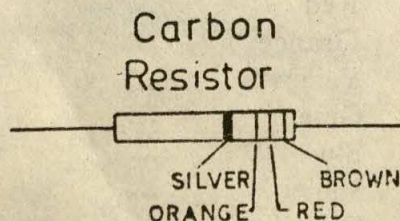


FIG. 3.3.1

Brown (Br)	= 1	12
Red (R)	= 2	
Orange (O)	= 3	12×10^3
Silver (Si)	= 10% tolerance	

Hence the value of 10% tolerance
 = 12 k-ohm carbon resistance
 [k stands for kilo (ce) $\times 10^3$].

IV. Battery Power Supply

1. COLLECT THE FOLLOWING MATERIALS

- | | |
|--|-----------|
| i) Dry cells 1.5 V each | Two |
| ii) Wooden, plastic or perspex box | One |
| iii) Steel springs | Two |
| iv) Terminal screws | Two |
| v) Washers and nuts for terminal screws | Four each |
| vi) Aluminium strip 5 cm $\times$ 2.5 cm $\times$ 0.3 cm | One |

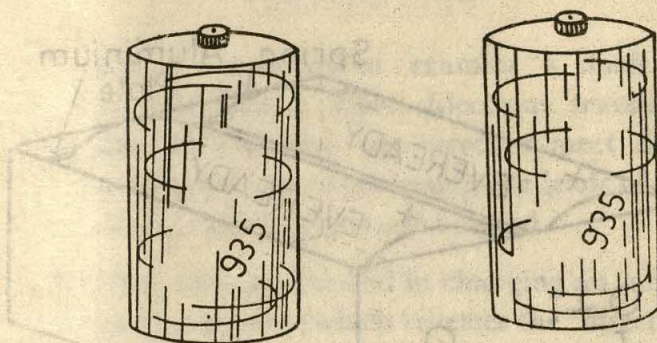


FIG. 3.4.1

2. Take two dry-cells 1.5 V each. These are usually available in three different sizes numbered as 915, 935 or 950. Fig 3.4.1. Leak-proof cells are numbered as 1015, 1035 and 1050. On one side, you see the brass metallic cap sealed in the centre which is positive of the cell while on the other side a flat metallic surface which is the negative of the cell. You can obtain the output of the cell from these two points i. e., cap positive and the bottom flat surface negative.

Connect more than one cells in series such that the cap of one touches the bottom of the other directly or through a conductor and finally the two extreme ends, one positive and the other negative, give the output of the battery power supply. Fig. 3.4.2.

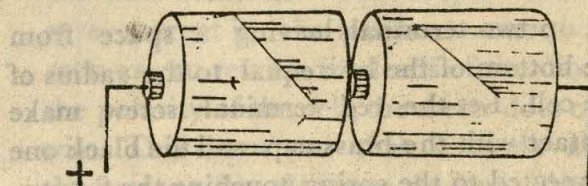


FIG. 3.4.2

3. Take a wooden, plastic or perspex box of suitable size to accommodate the two dry-cells with a spacer and sufficient margin for an aluminium strip, springs and terminals. The internal length should be at least $1/2'$ more than the length of the cells to be used. The internal width of the box is twice the diameter of the cell plus the thickness of the spacer, a wooden or perspex strip nearly ($1/4'$) thick. Fig. 3.4.3.

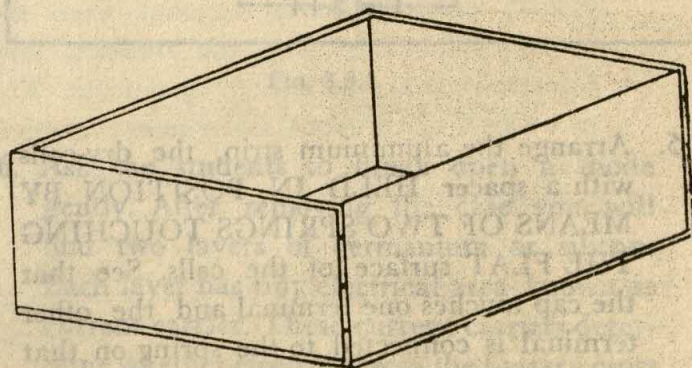


FIG. 3.4.3

4. Fix up two terminals leaving a space from the bottom of the box equal to the radius of the cell. Let the red terminal screw make contact with the brass cap and the black one connected to the spring touching the flat surface. (Fig. 3.4.4)

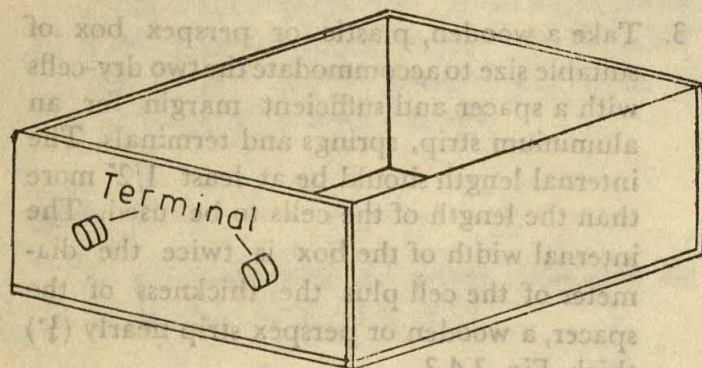


FIG. 3.4.4

5. Arrange the aluminium strip, the dry-cells with a spacer HELD IN POSITION BY MEANS OF TWO SPRINGS TOUCHING THE FLAT surface of the cells. See that the cap touches one terminal and the other terminal is connected to the spring on that side as shown in the Fig. 3.4.5

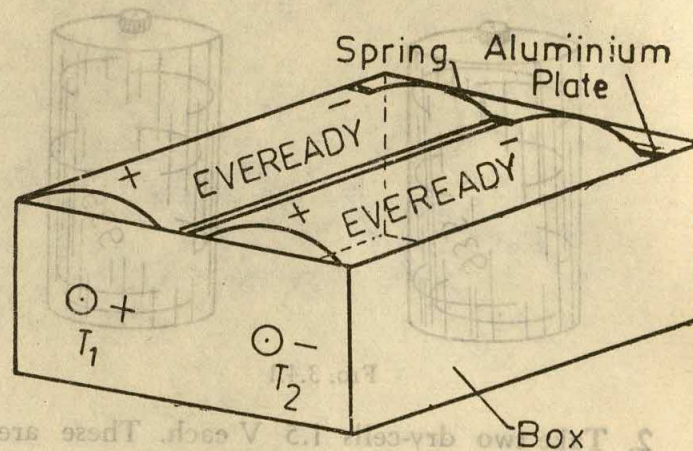


FIG. 3.4.5

The battery power-supply is ready for use. A red piece of wire is connected to the red terminal and the black piece of wire is connected to the black terminal which are connected to energise the circuit or equipment needing a 3 V supply

Similarly, make a 6 V battery supply by connecting 4 cells in series like this.

See that the naked positive and negative wires should not touch directly because they short-circuit the battery and the cells will be damaged.

V. Diode (One-way Effect)

1. Ask the students to examine a diode. It behaves like a valve. Electrons travelling through a diode in one direction meet little resistance. But on reversing the leads of the diode, most electron are blocked.
2. This property is useful in changing an alternating current (which reverses the direction periodically) into a unidirectional current. Therefore, use diodes for changing A. C. to D. C. i. e., for rectification.
3. COLLECT THE FOLLOWING MATERIALS
 - i) A dry cell
 - ii) A diode
 - iii) A high resistance
 - iv) A switch
 - v) A milli-ammeter.
4. Arrange the components as given in the (Fig. 3.5 1). Put the high resistance in series with a single dry cell to reduce the flow of the current in the circuit to the tolerance of the diode used.
5. Switch on the circuit. Read the current by

the milli-ammeter. You might read even zero current in the milli-ammeter but as soon as you reverse the leads of the diode or the polarity of the cell, the meter does otherwise. This shows you that a diode allows the passage for electrons in one direction only. Ask the students to note the mark on the diode when it allows passage of electrons through it.

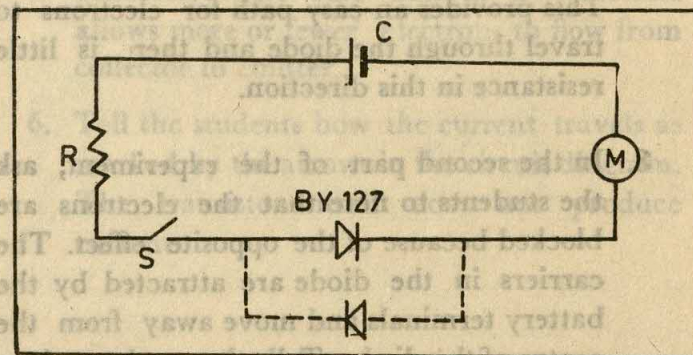


FIG. 3.5.1

6. Ask the students to break open a diode gently. After removing the case you will find two layers of germanium or silicon. Each layer has tiny electrical area known as current carrier. These current carriers determine whether electrons from the battery cross

the diode by forming either a bridge or a barrier between the two sections of the semiconductor.

7. In the first part of the experiment when the meter reads the current because the battery pushes the current carriers towards the centre of the diode where you find the junction between the two germanium or silicon areas. This provides an easy path for electrons to travel through the diode and there is little resistance in this direction.
8. In the second part of the experiment, ask the students to note that the electrons are blocked because of the opposite effect. The carriers in the diode are attracted by the battery terminals and move away from the centre of the diode. Tell the students how the electrons are unable to penetrate. The movement of electrons and current carriers occur within only a few millionths of a second.
9. The know-how gained by this experiment will be utilized by the students in assembling a D. C. power-supply.

VI. Transistor

1. COLLECT THE FOLLOWING MATERIALS

- i) Carbon resistors (68 K, 100 K, 220 K and 4.7 K) (one each)
- ii) Transistor AC 126 (one)
- iii) D. C. Milli-ammeter 0-1 (one)
- iv) Switch, Battery, Board, Clips and Hook-up wire.

2. Ask the students to observe the transistor. Tell them the names of the three leads (Emitter, base and collector). Always check the base diagrams for the correct position of these leads before switching on the power. Tell the students that some transistors have four leads also but the fourth lead is connected to the case for grounding. Fig. 3.6.1.

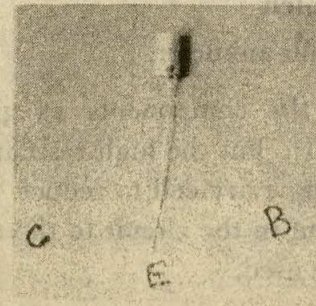


FIG. 3.6.1

3. Wire the circuit as given below. Check the positions of the leads of the transistor. Fig 3.6.2

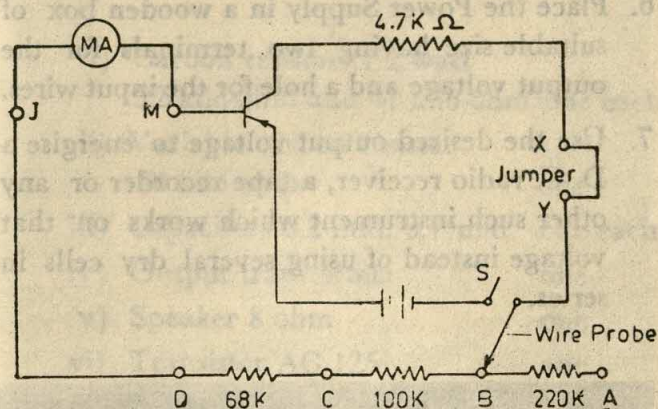


FIG. 3.6.2

4. Connect the two ends of a piece of wire (called jumper) to points X and Y and switch on the battery supply. Touch the resistor connections marked A, B, C in the diagram one by one with the wire probe to measure the current fed into the transistor and to compare it with the output current. Note the readings in each case. You observe that you fed current to the base in this case.
5. Remove the jumper from X and Y and connect it to J and M. Connect the milli-

ammeter between X and Y. Touch A, B, C connections separately by the wire probe and note the readings of the milli-ammeter. The current flowing out of the transistor is ten times higher than the current fed to it. Tell the students about transistor amplification—a small current in the base causes a much larger current to travel through the collector. The base acts as a valve and allows more or fewer electrons to flow from collector to emitter.

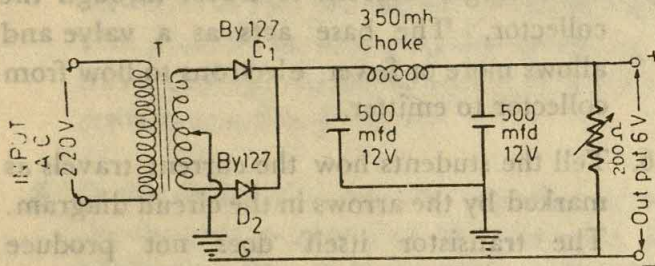
6. Tell the students how the current travels as marked by the arrows in the circuit diagram. The transistor itself does not produce current.

VII. D. C. Power Supply

1. COLLECT THE FOLLOWING MATERIALS

- | | |
|--|-------|
| i) Diode by 127 | (two) |
| ii) Capacitors 500 mfd 12 V | (two) |
| iii) Choke 350 mh | (one) |
| iv) Wire wound resistor adjustable 200 ohm | (one) |

- v) Transformer delta 175 (one)
 - vi) Chassis, wooden box terminals, pilot lamp, tag strips with holder, switch and wire etc.
2. Connect the components as shown in the circuit on a board or on a chassis by using tag trips. (Fig 3.7.1)



POWER SUPPLY (Battery Eliminator)

FIG. 3.7.1

3. Take care of the sign of the diodes and the capacitors while connecting these in circuits. Insert the input plug of the power supply into the socket of the mains (220 V).
4. Measure the output voltage between A and B and adjust the resistor R to get the desired voltage. This is known as a battery eliminator also.
5. Improve the circuit by using four diodes instead of two or a metal rectifier in place of

sorting the mail. Get them do it.

SOCIALLY USEFUL PRODUCTIVE WORK III

- diodes for better performance of the power supply.
6. Place the Power Supply in a wooden box of suitable size having two terminals for the output voltage and a hole for the input wires.
7. Use the desired output voltage to energise a D. C. radio receiver, a tape recorder or any other such instrument which works on that voltage instead of using several dry cells in series.

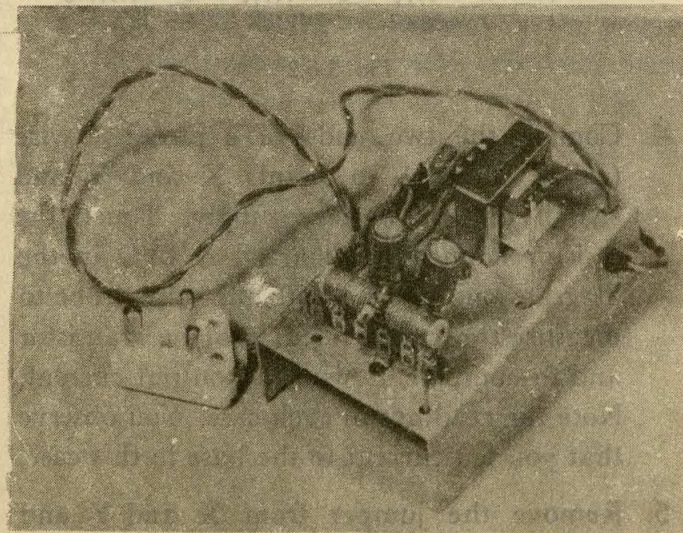
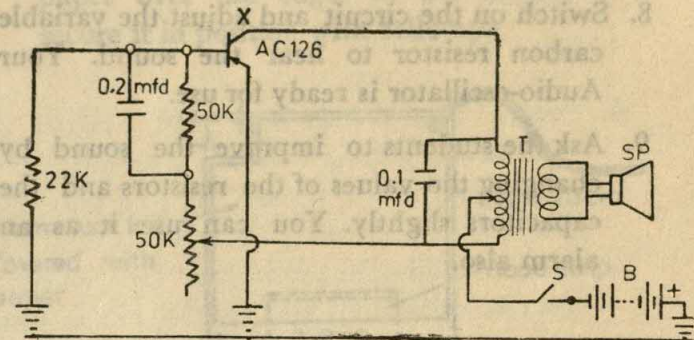


FIG. 3.7.2

VIII. An Audio-oscillator

1. COLLECT THE FOLLOWING MATERIALS

- i) Carbon resistors 1/2 watt
22 kilo-ohm and 47 kilo-ohm one each
 - ii) Variable carbon resistor
50 kilo-ohm one
 - iii) Capacitors 0.2 mfd. 0.1 mfd one each
 - iv) Output transformer one
 - v) Speaker 8 ohm one
 - vi) Transistor AC 126 one
 - vii) Battery (dry) 6 Volt/9 Volt one
 - viii) Hook-up wire, terminals and tag strips etc.
2. Fix the variable carbon resistor, two terminals and two tag strips on a chassis or a board. Fix the speaker on a panel or in a separate box having holes. Connect the speaker to the two banana sockets fitted to the back side of the same box. (Fig. 3.8.1)
 3. Connect all other components given above as shown in the following circuit. (Fig 3.8.1)

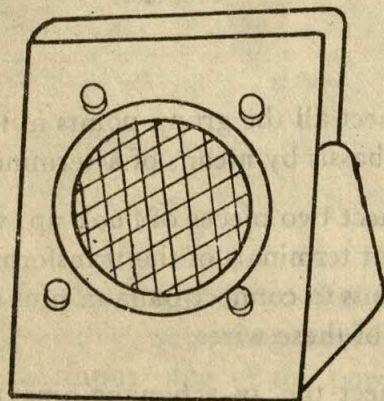


AUDIO OSCILLATOR

FIG. 3.8.1

4. Connect all the group points in the circuit to the chassis by means of a terminal.
5. Connect two pieces of hook-up wire to the output terminals of the transformer. Ask the students to connect banana pins to the free ends of these wires.
6. Connect the two banana-pins to the two banana-sockets of the speaker box.
7. Check all the connections and connect the + ve of the battery to the ground terminal and the negative to the centre tap of the transformer through a switch.

8. Switch on the circuit and adjust the variable carbon resistor to hear the sound. Your Audio-oscillator is ready for use.
9. Ask the students to improve the sound by changing the values of the resistors and the capacitors slightly. You can use it as an alarm also.



Speaker Chassis

FIG. 3.8.2

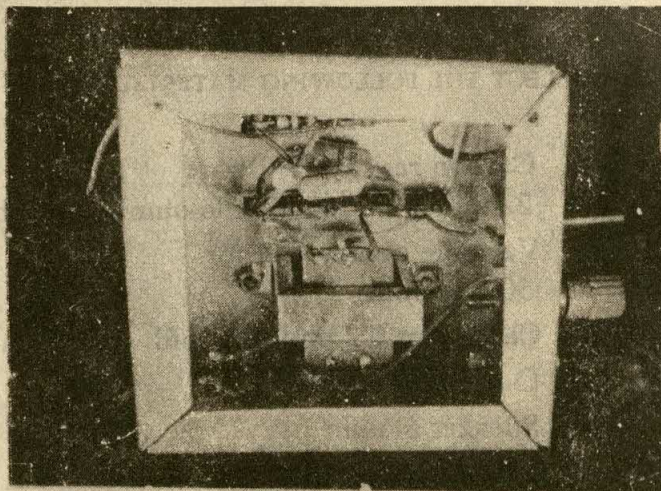


FIG. 3.8.3

IX. A Radio Receiver (Local)

1. Collect a ferrite rod, a piece of card-sheet (6 cm $\times$ 4 cm) and super enameled copper wire S. W. G. 36.
2. Ask the students to wrap the card sheet around the ferrite rod and to paste the end. See that the ferrite rod can slide in the card-

3. Now ask the students to wind the enamelled copper wire around the former leaving $1/2$ cm length of the former on either side. Leave 20 cm length of the enamelled wire on either end as leads. Let the turns be close to each other. Ask the students to hold the first and the last turn in position by means of pieces of sticking tape. Use this coil in the receive circuit. (Fig. 3.9.1)

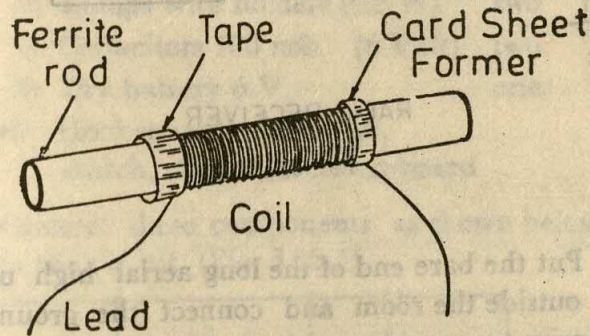


FIG. 3.9.1

4. Again ask the students to cut two identical pieces 10 cm square each, out of a hard-board sheet. Notch 1.5 cm square corners of the two hard-board pieces as shown in Fig. 3.9.2. Glue a piece of Aluminium foil to the smooth surface of each board. Fold thick

paper over the edges of the boards and secure it in position with cello tape.

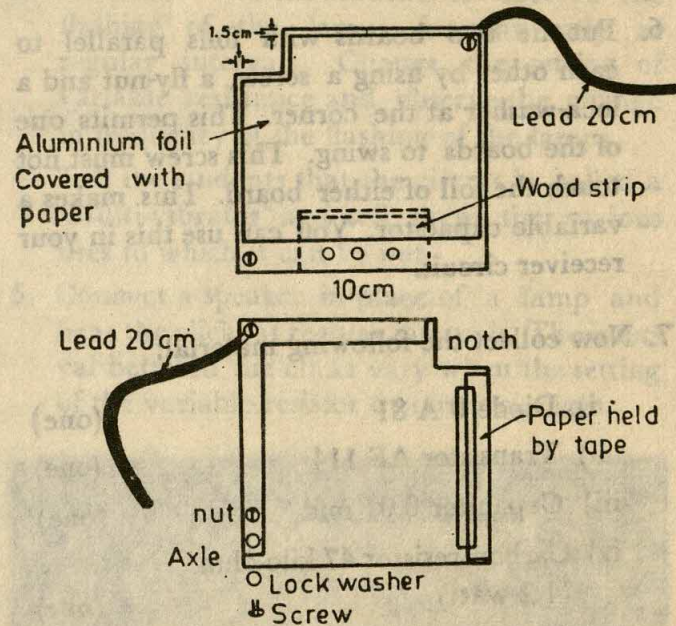


FIG. 3.9.2

5. Carefully cut away a small piece of paper for screw head to come in contact with the foil. Connect the two leads to the two boards using a screw and a nut for each lead. Make sure that the screw head makes contact with

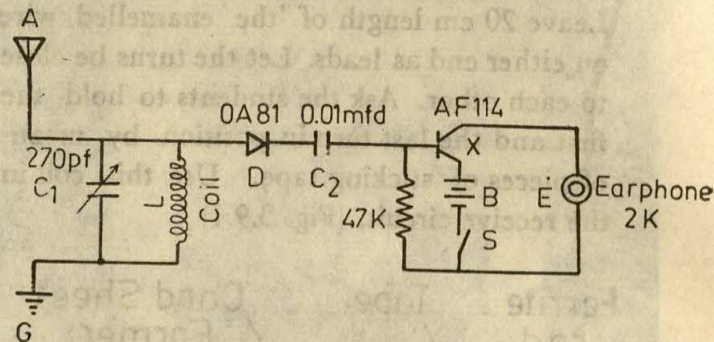
the Aluminium foil. Do not cut or tear the foil while screwing the nut that holds the wire.

6. Put the two boards with foils parallel to each other by using a screw, a fly-nut and a lock-washer at the corner. This permits one of the boards to swing. This screw must not touch the foil of either board. This makes a variable capacitor. You can use this in your receiver circuit.

7. Now collect the following material:

- | | |
|---|-------|
| i) Diode 0 A 81 | (one) |
| ii) Transistor AF 114 | (one) |
| iii) Capacitor 0.01 mfd | (one) |
| iv) Carbon resistor 47 kilo-ohm
(1/2 watt) | (one) |
| v) Dry-cells 1.4 V | (one) |
| vi) Ear-phone 2K | |
| vii) Switch, long pieces of wire,
circuit-board or chassis with
tag strips, hook-up wire etc. | |
| viii) Variable capacitor and coil, (one each) | |

8. Connect these components as shown in the circuit on a board or on a chassis. (Fig. 3.9.3)



RADIO RECEIVER

FIG. 3.9.3

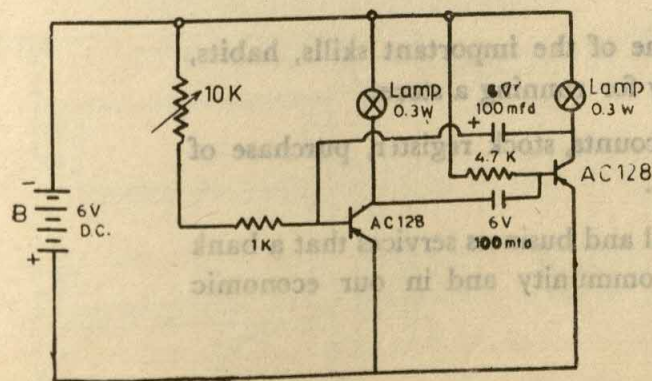
9. Put the bare end of the long aerial high up outside the room and connect the ground wire to water tap.
10. Turn the completed radio receiver on with the switch and listen to the earphone. Start rotating the variable capacitor by means of finger tip very slowly. You pick up one or two stations of your area. Lock the variable capacitor in that position by means of the fly-nut and listen to that programme.

X. A Multivibrator

8. Collect the following components

- i) Carbon resistors 1 kilo-ohm one each
and 4.7 kilo-ohm (1/2 watt)
- ii) Variable resistance (pot type) 10 K one
- iii) Transistors AC 128 two
- iv) Lamps with holders (0.3 W) two
- v) Capacitors 100 mfd (6 Volt) two
- vi) Dry battery 6 V one
- vii) Hook-up wire, tag-strips, switch, chassis or circuit-board

2. Connect these components as shown below in the circuit. (Fig. 3.10.1)



MULTIVIBRATOR
FIG. 3.10.1

3. Switch on the circuit. Adjust the variable resistance. Ask the students to observe the flashing of the lamps intermittently at regular intervals. Change the setting of variable resistance and observe the change in frequency of the flashing of the lamps.
4. Tell the students that the circuit is called a 'Multi-vibrator' and tell them the various uses to which it can be put.
5. Connect a speaker in place of a lamp and hear the clicks at regular intervals. The interval between the clicks vary when the setting of the variable resistor or meter changes.

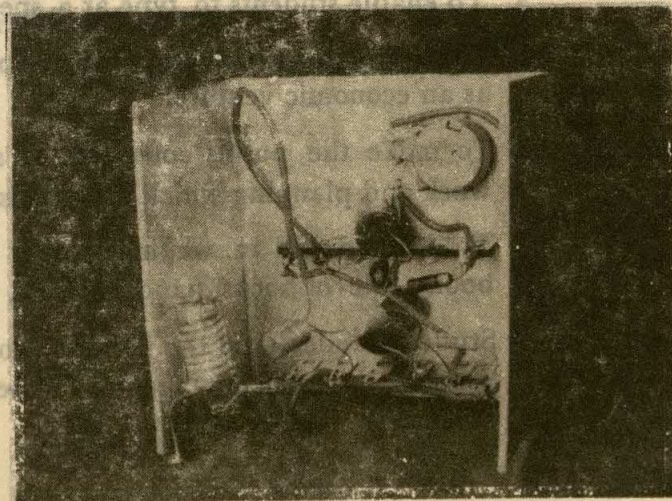


FIG. 3.10.2

4

Commerce

OBJECTIVES

1. To develop good techniques and habits of typing work.
2. To provide basic knowledge of introductory skill in typing letters and statements for their personal use.
3. To enable students to type at a speed of 15 to 20 words per minute.
4. To make students aware of the importance and meaning of cooperation as an economic venture.
5. To make the pupils conscious of some of the important skills, habits, work and planning which are necessary for running a store.
6. To develop skill in writing ledger accounts, stock register, purchase of books, sale of books, handling cash, etc.
7. Students understand the personal, social and business services that a bank renders as financing agency in the community and in our economic system.

8. Students learn the use of various forms used in a bank for a variety of purposes.
9. Students develop skill of writing cash book, passbook, ledger accounts, daily scroll, etc. maintained by bank.
10. Students understand the procedure of maintaining inward and outward correspondence in a small office.
11. Students realise the significant role of correspondence in their daily life.
12. Students learn the use of letter-received and letter-sent books.
13. Students develop skill in filing typed or hand written letters through flat filing-vertical filing system subjectwise.
14. Students develop skill in indexing letters through alphabetical order.
15. Students locate letter from files whenever needed.

I. Typewriting

Typewriting has come to be recognised as a very useful means of communication and occupation whether it is an office, business organization, a court, educational institution or research laboratory. Typing plays the important role of maintaining correspondence, keeping records, making documents, etc. In the present day life it is a skill that every civilised human being would like to cultivate. Things being so it is desirable that typing is made SUPW activity in all schools and even in colleges. It pays to develop the skill in the long run.

Tension of any sort induces fatigue; so relax, relax and RELAX.

PRACTICAL EXERCISES

1. With the help of demonstration and chart explain the sitting posture at the machine. Stress correct typing techniques and again emphasise the following wherever need arises.

Keep your feet flat on the floor.

Keep your head erect, with eyes on the copy.

Keep your forearms relaxed and in a horizontal position.

Your elbows must be motionless.

Your body should be slightly forward.

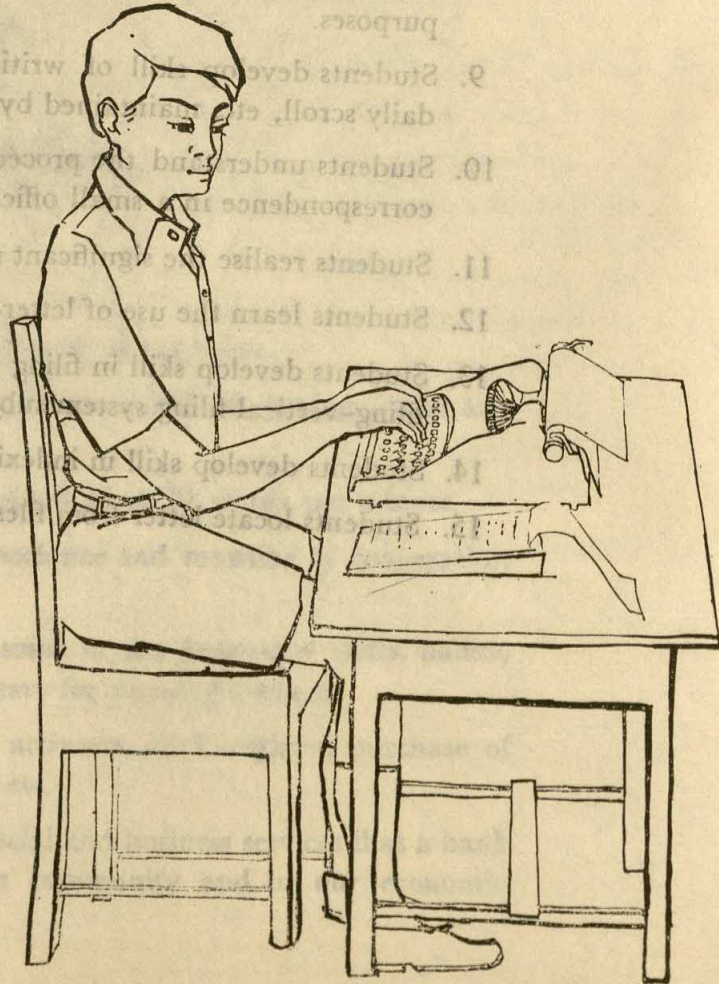


FIG. 4.1.1

2. Explain the working and use of the important typewriter parts such as space-bar, shift-key, shift-lock, back-space key, key-release-lever, tabular-clear-key, carriage-return lever, tabular bar, line-space-regulator, paper guide, margin stops, cylinder, paper bails, paper release and margin-release-key.

3. Demonstrate the following steps and guide the students

- i. Adjust the paper guide.
- ii. Insert the paper.
- iii. Straighten the paper.
- iv. Adjust the paper bail.
- v. Adjust the line space regulator.
- vi. Set the margin stops.
- vii. Return the carriage.

A. PRACTISING 'HOME KEYS' OR 'GUIDE KEYS'

1. *Instructions:* Insert and adjust the paper. Adjust single line spacing and fix margins.

- a. Place four fingers of each hand on home keys. Instruct them to make light contact with the keys.

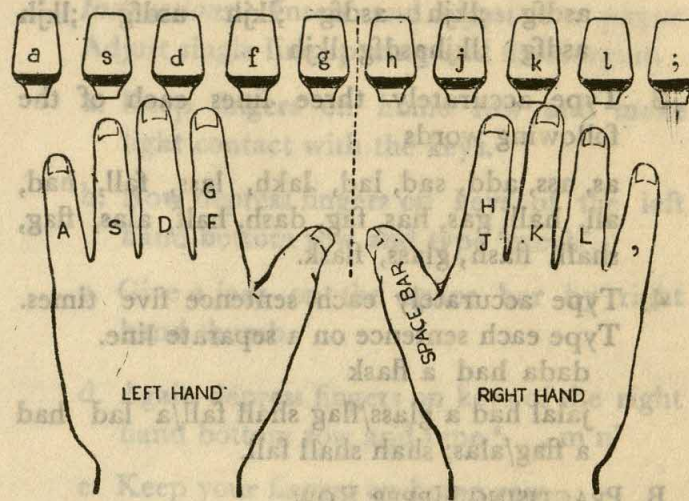


FIG. 4.1.2

b. Now, depress fingers on keys of left hand and type 'asdf' (f and g are typed by the same finger).

c. Give a jerk on the space bar by right hand thumb.

d. Again depress fingers on keys of right hand and type 'lkj' (j and h are typed by the same finger).

e. Type three lines accurately—'asdfg ;lkjh'.

2. Do not proceed unless you have typed at least ten lines without error.

asdfg ;lkjh asdfg ;lkjh asdfg ;lkjh
asdfg ;lkjhasdfg ;lkjh

3. Type accurately three lines each of the following words

as, ass, add, sad, lad, lakh, lass, fall, had,
all, hall, gas, has, fag, dash, half, alas, flag,
shall, flash, glass, flask.

4. Type accurately each sentence five times.
Type each sentence on a separate line.

dada had a flask

jalal had a glass/flag shall fall/a lad had
a flag/alas; shah shall fall.

B. PRACTISING UPPER ROW

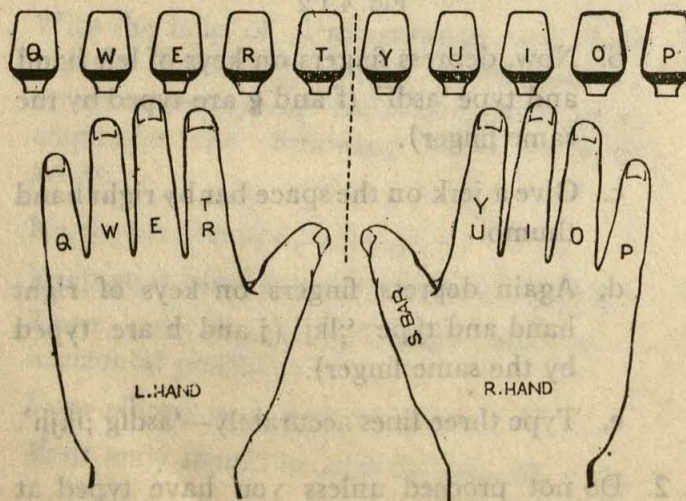


FIG. 4.1.3

1. *Instructions* : Insert and adjust the paper.
Adjust single line spacing and fix margins
1" on the left and $\frac{1}{2}$ " on the right.

- Keep fingers on home row. Make light contact with the keys.
- Lift fingers of left hand on upper row one by one and type 'qwerty' (r and t are typed by the same finger).
- Give a jerk on the space bar by right hand thumb.
- Now, lift again the fingers of right hand on upper row one after another and type 'poiuy'.
- Only one finger must move at a time, while others, must remain on home row.

2. Do not proceed unless you have typed at least 10 lines without error.

qwerty poiuy qwerty poiuy qwerty poiuy
qwerty poiuy

3. Type accurately three lines of each of the following words:

at, it, do, or, to, be, up, the, his, are, try,
she, you, how, was, pay, our, eye, tie,
that, your, pure, sure, ripe, quit, tyre,

wire, four, tour, poet, pope, rope, write,
wrote, power, tower, future.

4. Type accurately each of the following sentences five times:

the poet is hurt.

the writer was happy.

the poor people always weep.

these are the words of good authors.

self help is the order of the day.

C. PRACTISING BOTTOM ROW

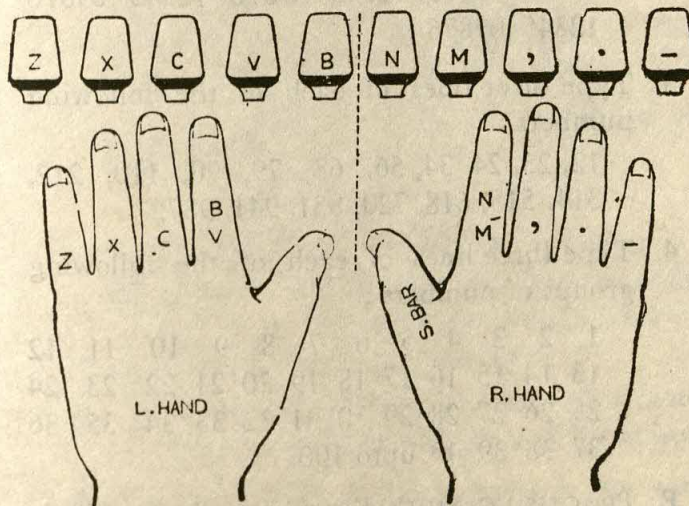


FIG 4.1.4

1. **Instructions :** Insert and adjust the paper. Adjust single line spacing and fix margins.
 - a. Keep fingers on home row and make light contact with the keys.
 - b. Now depress fingers on keys of the left hand bottom row and type 'zxcvb'.
 - c. Give a jerk on the space bar by right hand thumb.
 - d. Again depress fingers on keys of the right hand bottom row and type '- . , m n'
 - e. Keep your fingers on home row.
2. Do not proceed unless you have typed at least 10 lines without error.

zxcvb -.mn zxcvb -.mn zxcvb -.mn
zxcvb -.mn
3. Type accurately three lines of each of the following words:

on, no, in, be, man, can, ten, ran, any,
and, him, but, name, more, main, them,
then, very, only, navy, zeal, child, chalk,
small, local, number, member, remember,
general, several, manner, behalf. nature.

4. Type accurately each of the following sentences five times:

my name is ram mohan.

the child wants a small chalk.

typewriting is a useful activity in life.

it is a skill helpful to all persons.

a student who cannot type misses something.

D. PRACTISING NUMBER ROW

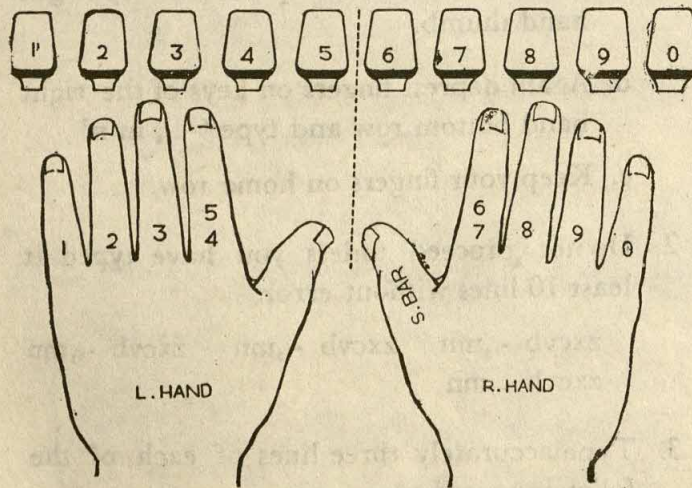


FIG. 4.1.5

1. **Instructions :** Insert and adjust the paper. Adjust single line spacing and fix margins.

a. Keep fingers on the home row and make light contact with the keys.

b. Now, lift fingers of the left hand on the top row keys one by one and type '12345'.

c. Give a jerk on the space bar by right hand thumb.

d. Again, lift fingers of the right hand on the top row one after another and type '09876'.

e. Keep your fingers on home keys.

2. Do not proceed unless you have typed at least 10 lines without error.

12345 09876 12345 09876 12345 09876
12345 09876

3. Type three lines of each of the following numbers :

12, 23, 24, 34, 56, 68, 79, 90, 110, 212,
314, 515, 618, 720, 831, 941, 987.

4. Type three lines of each of the following groups of numbers :

1 2 3 4 5 6 7 8 9 10 11 12
13 14 15 16 17 18 19 20 21 22 23 24
25 26 27 28 29 30 31 32 33 34 35 36
37 38 39 40 upto 100.

- E. PRACTISING SHIFT KEYS. To obtain single capital letters and upper-case signs depress

one of the two shift keys. The shift keys must be operated with the little fingers.

1. When a capital letter on the right-hand side of the key board is to be typed, depress left-hand shift key by the little finger of left hand.
2. When the capital on the left-hand side is desired the right-hand key is held down by right hand little finger.
3. For typing two or more than two capital letters continuously—make use of shift lock by pressing the shift lock key and type as many letters as are required. Release the lock by pressing the shift key.
4. Depress the shift key sufficiently to type upper-case letters in line with others.
5. Type accurately three lines of each of the following drills:
 - i) ABCDEFGHIJKLMNOPQRSTUVWXYZ
 - ii) ZYXWVUTSRQPONMLKJIHGFEDCBA
 - iii) HASTE causes WASTE, and WASTE causes WANT and WANT makes STRIFE between the GOOD MAN and his WIFE.
 - iv) N. C. E. R. T. means National Council of Educational Research and Training.
- F. CENTRING. Horizontal centring is the term used for placing typewritten words at an

equal distance between the right and left margins of the paper.

STEP I. The teacher must show the class a model of something which has been correctly centred on the page pointing out the attractiveness of the paper spacing.

STEP II. (a) Fold a sheet of paper vertically at the centre and insert into the typewriter.

(b) Set the carriage at centre.

(c) Back-space once for each of two strokes as you repeat to yourself.

(d) Type the words.

STEP III. After the students have practised with the teacher, let them repeat the following exercises at their own pace.

(a) Indian Independence Day.

(b) Government Higher Secondary School.

(c) Office of the Director of Public Instruction.

(d) National Council of Educational Research and Training.

(e) Ministry of Education & Social Welfare.

STEP IV. The teacher should supervise and coach in the step-by-step procedure as the students work.

A FEW TYPING DRILLS

1. **ALTERNATE-HAND WORDS.** Type three lines of the following words in pairs:
are joy. fast mill. read nill. after imply.
great nylon.
2. **BALANCE-HAND WORDS.** Type three lines of each of the following words:
risk, right, theme, panama, europe, form,
information, gentleman.
3. **SAME LETTERS AND DIFFERENT WORDS.** Type three lines of the following words in pairs:
read dear/move rome/rose sore/stop post.
4. **COMMON WORDS.** Type three lines of the following common words:
to, if, am, my, go, the, for, them, this, from,
will, those, these.
5. **DRILL TO STRENGTHEN WEAK FINGERS.** Type the following words and sentences three times:
 - i) popular, extra, union, tax, policy, look,
wax, quickly, was, plates, policeman.
 - ii) Only I was quite puzzled by his apparent
lack of aptitude for the job.
6. **REPEATED LETTER DRILLS.** Type each of the following words (three lines):
good, food, off, staff, excess, professor, add,
assessor, succeeded, baggage, message,
committee, puzzling.
7. **DRILL OF ALPHABETIC SENTENCES.** Type the following sentences in three lines:
 - i) The quick brown fox jumps over the lazy dog.
 - ii) The boxes were booked in a jeep for the zoo, yet the children asked many vulgar questions.
 - iii) The zonal inspector went to the Navy today for making enquiries about jetty taxes.
 - iv) The vixen were ordered to quit the balmmy zone for plucking jasmine.
 - v) The perplexed and over-zealous member jumped out of the factory gate quickly.
8. **DRILLS FOR DIFFICULT REACHES.** Type the following three times each.
 - i) A number of unknown men united to receive a uniform annually.
 - ii) under umbrella untold umpire unlike
jump hump pump damp.
9. **CONCENTRATION DRILLS.** Type the following words in pairs in three lines:

former farmer/price prize/through thought/
being begin/to too/daring during/sing sang.

10. DRILL TO DEVELOP NUMBER ROW MASTERY.
Type the following three times:

1 and 2 and 3 and 4 and 5 and 6 and 7 and
8 and 9 and if 12 to 19 so 28 up 30 of 85 do
76 so 88 be 63 go 84, 123454, 098767, 123454,
098767, 34½, 56½.

11. WARM-UP DRILL: Type each of the following
phrases three times:

if it is, if you are, to do so, we will be, you
will be able to.

12. ONE-MINUTE REPETITIVE WRITINGS. Type
the following:

All men may go to the end of the lane if
they wish.

13. GOAL TYPING. Type the following as fast as
you can:

What is the worth of man that he should
live upon the earth and for what good does
he inhabit the planet of earth ?/ There must
be some good that he can accomplish as he
plies his daily trade which will add to the
good humanity as well as to the comfort of
his own being/ It is not true that man

breathes and lives and goes about his work
in such a way as to add to his own better-
ment ?/ Then, too, he should add to the
betterment of his associates and attempt to
improve the society which supports him./

II. School Cooperative Store as a SUPW Project

A. NATURE AND SCOPE

The cooperative store project has been con-
ceived as a SUPW project with a view to
inculcate self help, service responsibility and
cooperation among the students. The store is
expected to cater to the petty needs of the
student community such as, stationery books
etc. A well-known school cooperative store can
create a learning situation for students by
involving them in planning and organising
various phases of its activities in taking up
functions performed by counter salesman,
book-keeper, supplier, manager, etc. The
project is undertaken with a team spirit under
the active guidance of an experienced teacher.

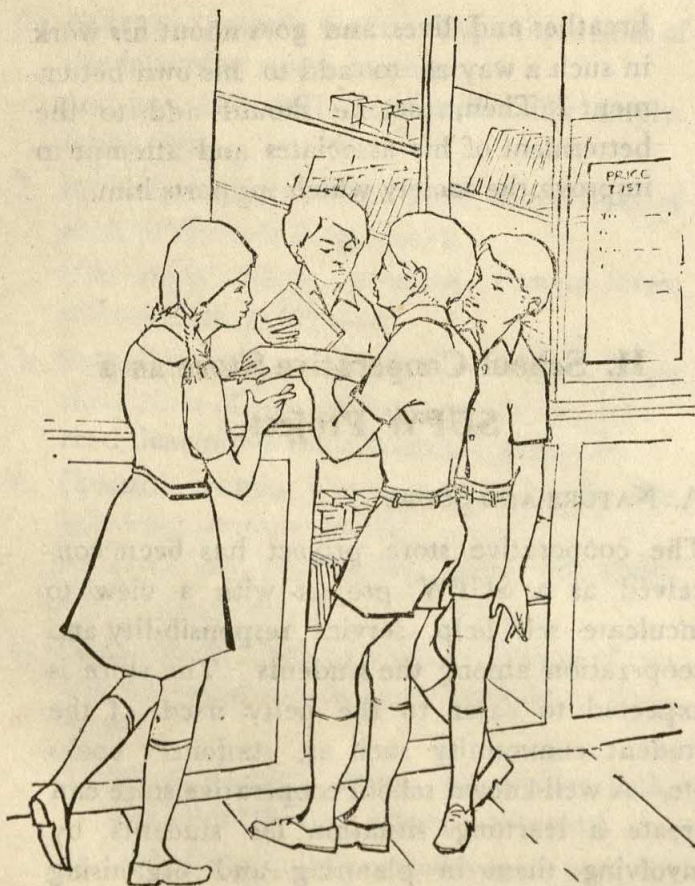


FIG. 4.2.1

B. PLANNING

- i) Guide the students in the formation of the cooperative society.

- ii) Guide the students in the preparation of 'Bye Laws' consisting of rules about activities, membership, capital, committees, accounts and audit.
- iii) Guide the students in preparing organisational framework for conducting different activities of the store such as purchases, sales, storage, accounts, audit, etc.
- iv) Prepare necessary forms and documents such as membership form, share certificate, receipts, etc.
- v) Prepare rules governing office bearers and their functions.

C. ORGANISATION

- i) Call a general meeting of students and staff members and form an ad hoc committee to get it registered under the Cooperative Society Act.
- ii) Enrol members and raise capital.
- iii) Hold elections for electing student office bearers in the Executive Committee such as Secretary, Joint-Secretary, Treasurer, etc.

- iv) Hold preliminary meeting of the General Body for taking major policy decisions.
- v) Acquaint the student office bearers with their duties and responsibilities
- vi) Prepare rules for transfer of shares, forfeiture of shares and withdrawal of share money.

D. EXECUTION

- i) Arrange for working space, stationery, registers, cash box, files, almirah, show window and other necessary articles.
- ii) Open a savings bank account of the store in a Bank or Post Office and acquaint the students with the method of its operation.
- iii) Orient the purchase committee to buy articles economically and set an appropriate procedure.
- iv) Train the students in store-keeping and counter salesmanship.
- v) Train the student committee about writing letters and maintenance of proper files.

- vi) Demonstrate the method of keeping accounts, maintaining stock register and preparation of Final Accounts.
- vii) Hold meetings of the Executive Committee every month for managing store's affairs.
- viii) Arrange for an audit after every two months by the audit committee.
- ix) Fix prices of articles on the principle of minimum profit to enable members to receive goods at a cheaper price.

SPECIMEN

BYE-LAWS OF STUDENTS' COOPERATIVE STORE

OBJECTIVE

To promote a feeling of sharing responsibilities for the common cause among students and develop the habit of self help and mutual cooperation.

ACTIVITIES OF THE STORE

1. Purchase and sale of articles of common use like text books, stationery, etc.
2. Fixing selling prices and recording transactions in various books of accounts and stock book, etc.

3. Window display.
4. Audit of accounts and distribution of profit amongst share holders at the end of the session.

MEMBERSHIP

All the students of the school are eligible to become members of the store. They shall fill in the membership form obtained from the Secretary of the cooperative store and pay the required membership fee. They shall also deposit the value of the shares allotted to them and obtain share certificates.

CAPITAL

The capital of the store will be divided into transferable shares of Rupee one each or any denomination considered suitable. The liability of the share holders will be limited upto the value of shares purchased by each member.

EXECUTIVE COMMITTEE

- A. The Executive committee shall consist of:
 - i) President
 - ii) Vice-President
 - iii) Secretary

- iv) Joint Secretary
- v) Treasurer
- vi) Four Members.

- B. The Head of the Institution shall be the ex-officio President of the cooperative store. The Vice-President shall be nominated by the Head of the Institution from among the staff of the school. All other office bearers shall be elected by the students of the school. The election shall be conducted in the beginning of each academic session. All office bearers shall hold office for one academic session except students who will change responsibility by rotation.
- C. The President and the Vice-President shall be responsible for proper working of the cooperative store. All policy matters shall be discussed in the executive body which may meet at least once in two months and shall be presided over by the President. In absence of the President the Vice-President shall perform the functions of the President.
- D. In the opinion of the President and the Vice-President, should the cooperative store be found not functioning satis-

factorily, the President shall have the power to dismiss the elected office bearers and may order a fresh election or run the cooperative store with appropriate arrangement to safeguard the interest of the students.

DUTIES AND POWERS OF THE PRESIDENT

1. He shall preside over the meeting of the General Body and the Executive Committee.
2. All decisions taken by the Executive will become valid only when the President approve of them.
3. All bills shall be valid for payment when countersigned by the President.
4. The President shall have the right of disallowing any activity, decision of any office bearer when it warrants without assigning any reason.

DUTIES OF THE SECRETARY

1. He shall carry on correspondence on behalf of the cooperative store.
2. He shall organise activities as chalked out by the Executive Body.

3. He shall keep the proceedings of all meetings and report them in the subsequent meeting.
4. He shall present to the general body the annual report of the activities of the store.
5. He shall make purchases as authorised by the Executive Body after duly getting the sanction for the purchase from President and Vice-President.

DUTIES OF THE JOINT SECRETARY

He shall assist the Secretary in his work and officiate as Secretary during his absence.

DUTIES OF THE TREASURER

1. He shall receive all moneys on behalf of the store.
2. He shall keep an account of all daily receipts and payments.
3. He shall make payment after the approval of the President.
4. He shall prepare the budget and get it passed by the Executive Committee.
5. He shall present the audited accounts at the Annual Meeting.

Note : All moneys received shall be deposited in a Bank or Post Office and the account shall be operated in the joint names of the President and the Treasurer.

DUTIES OF OTHER MEMBERS

The members of the Executive Body shall assist the treasurer in the purchase of goods, fix up selling prices, conduct day-to-day sales of goods and help the treasurer in maintaining proper books of accounts. (These members should divide the entire work according to their interests and abilities. The success of the store depends mainly on the zeal and enthusiasm of members.) They shall supervise proper conduct of business, point out deficiencies, methods of improving the working and advise the President when needed.

DIVIDEND

The dividend accruing to the share holders shall be determined by the executive body at the end of each academic year and be declared accordingly. Each member shall draw the dividend on presenting the share certificate. The payment shall be entered on the back of the certificate.

WITHDRAWAL OF SHARE MONEY

The share holder, when he desires to withdraw the share amount, shall give a notice of a week to the Secretary and shall surrender the share certificate before the share amount is returned.

AUDIT

The accounts of the cooperative store are to be audited after every six months by an audit committee consisting of Vice-President, SUPW Teacher, and two student members. The audited accounts are to be discussed first in the meeting of the executive committee and then in the general body meeting.

III. Students' Bank

INTRODUCTION

Money and banking are subjects about which students have a certain amount of information. All students in the class will have had experience in handling money. Some children might have their own savings bank account. In many homes the parents of the students may have personal bank accounts, or the members

of the family who are employed have their salaries paid by cheque. Almost all educated people sometime or other during their life time will use banking services. It is quite important, therefore, for students to acquire the skills in handling money and knowledge about banking services useful to them as consumers.

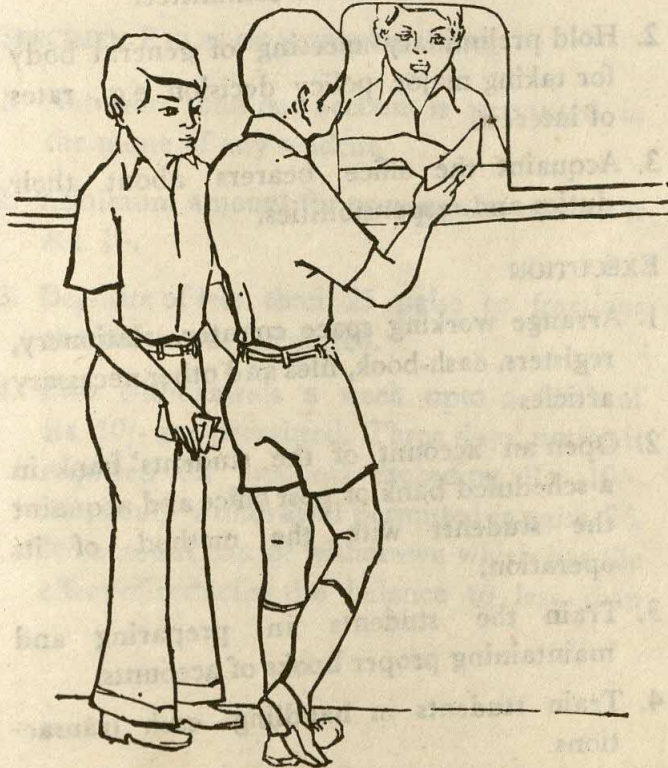


FIG. 4.3.1

COURSE CONTENT

Functions of a Bank, opening and operating bank account, writing and maintaining of various books of accounts and forms.

PRE-REQUISITES

- i) Wooden counter, chairs and tables.
- ii) Registers, pass books and various forms used in a bank.

FUNCTIONS AND IMPORTANCE OF BANKS

Explain the following functions of bank to the students:

- i) The bank gathers the earnings of people in the form of deposits.
- ii) It lends money to people to meet their demands.
- iii) It serves as an agent on behalf of customers.
- iv) It undertakes transmitting money from one place to another.
- v) Banks accept cheques and discount bills of exchange and promissory notes.

The teacher explains to the students :

That every person as well as a business concern stands to benefit by opening an account in a bank. He can keep his earnings safe. He can reduce handling of cash in his every day business by accepting cheques and by drawing cheques. A business concern can borrow money from the bank to expand its business. Cheques and Bills of exchange may be accepted to facilitate business as they can be easily collected and converted through the bank without difficulty.

PLANNING

1. Guide the students in the formation of students' bank in the school.
2. Frame the constitution of the bank which should include the following points:
(a) Membership, (b) Liability, (c) Capital, (d) Scope, (e) Management, (f) Transfer of Shares, (g) General Body Meeting.
3. Orient the students in preparing organisational framework in conducting the activities of the bank.
4. Prepare necessary forms e.g., Application

form, Pass Book, Pay-in-slip book, cheque book, withdrawal form

5. Prepare rotation rules of the office bearers.

ORGANIZATION

1. Hold election for electing student office bearers in the executive committee.
2. Hold preliminary meeting of general body for taking major policy decision e.g., rates of interest.
3. Acquaint the office bearers about their duties and responsibilities.

EXECUTION

1. Arrange working space counter, stationery, registers, cash-book, files and other necessary articles.
2. Open an account of the students' bank in a scheduled bank or post office and acquaint the students with the method of its operation.
3. Train the students in preparing and maintaining proper books of accounts.
4. Train students in handling cash transactions.

5. Hold meetings of the executive committee every month for managing the affairs of the students' bank.
6. Arrange for an audit after every two months.
7. Calculate interest of account-holders at the end of the financial year.

SPECIMEN RULES OF STUDENTS' BANK

1. Not more than one account is permitted in the name of any student.
2. Minimum amount for opening an account is Re. 1/-.
3. Deposits of less than 25 paise or fractions thereof is not permitted.
4. Two withdrawals a week upto a total of Rs. 10/- are permitted. Three days' notice is required for amounts exceeding Rs. 10/-. Minimum withdrawal permitted is paise 25. No amount can be withdrawn which has the effect of reducing the balance to less than

Re. 1/-, unless it is for the purpose of closure of account.

5. Rate of interest is 3 per cent per annum. No interest is allowed during a month if the balance falls below Rs. 10/- at any time between 5th day and the last day of the month. Interest is calculated once a year by 15th April.
6. For closing an account, the pass book should be presented with an application for withdrawal of the balance at the credit of the depositor. The account can be closed at the end of the year or at any time in the event of leaving the school.
7. No deposit or withdrawal is permitted from an account without the production of pass book. A fee of 25 paise should be paid for issue of a duplicate pass book in lieu of loss or spoilt pass book.
8. A depositor must furnish a fresh specimen signature if his mode of signing undergoes any appreciable change.

SPECIMEN FORMS

1. FORM OF APPLICATION FOR OPENING A SAVINGS BANK ACCOUNT

To

The Manager Students' Bank

I tender herewith (in words) Rs.....only for opening a
Savings Bank A/c in the name of.....s/o.....
Class.....Section.....

Signature of the Depositor

Signature of the Depositor

2. SPECIMEN OF PASS-BOOK/CUSTOMER'S ACCOUNT

Date	Particulars	Amount Withdrawn	Amount Deposited	Balance	Signature

3. FORM OF PAY-IN-SLIP

Account No..... Date.....19.....	Account No..... Date.....19.....
STUDENTS' BANK MALVIYA NAGAR SCHOOL	STUDENTS' BANK MALVIYA NAGAR SCHOOL
Depositor.....	Deposit Rs.....
Amount Deposited.....	In favour of Shri.....
.....	the sum of Rs. (Words).....
Signature.....	Rs. (Figures).....
	Signature of the Bank Manager.....
	
	Signature of the Depositor

4. FORM OF A CHEQUE

No..... Date.....19.....	No..... Date.....19.....
STUDENTS' BANK	STUDENTS' BANK
In favour of.....	Pay to..... <u>Bearer</u>
.....	<u>Order</u>
Amount.....	the sum of Rs.....
.....	(in words)
	Rs.....(in figures)
	
Signature	Signature

IV. Handling Inward and Outward Correspondence

(A) NATURE AND SCOPE

Commerce and trade now-a-days have to be carried on through the medium of letters. Among human being next to speech, the letter has always been, in one form or another, the most valuable and the most important means of communication. All the correspondence of business concerns pass through certain stages and it is worthwhile to study them; under this activity the students must learn the methods of receiving, opening, recording, classifying, mailing or posting incoming and outgoing letters.

(B) ORGANISATION

1. Divide the students into two groups—one dealing with the inward mail and the other with outward mail.
2. Distribute the work amongst students for different stages of operation e. g., sorting, opening and distributing etc.

(C) EXECUTION

1. Explain the procedure of stamping and sorting the mail. Get them do it.

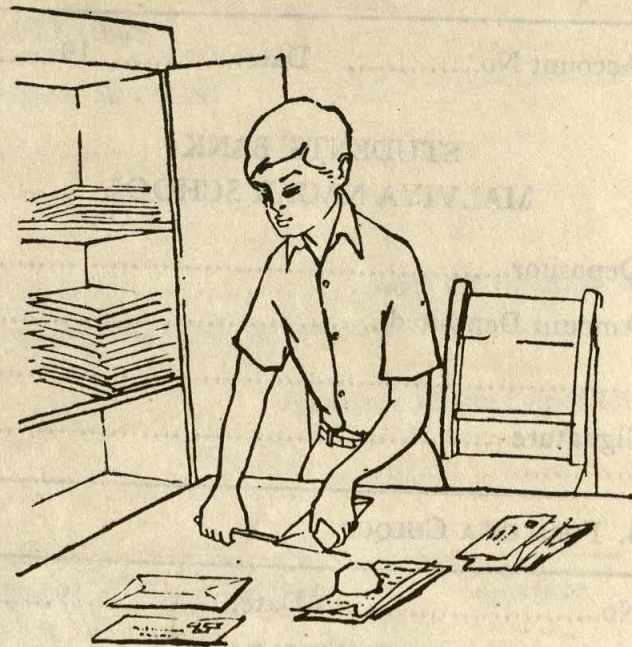


FIG. 4.4.1

2. Train them in entering the inward mail in letter-received book.
3. Acquaint them with the advantages of stamping and recording in the letter-received book.
4. Explain the procedure followed in the distribution of mail to individuals and departments.

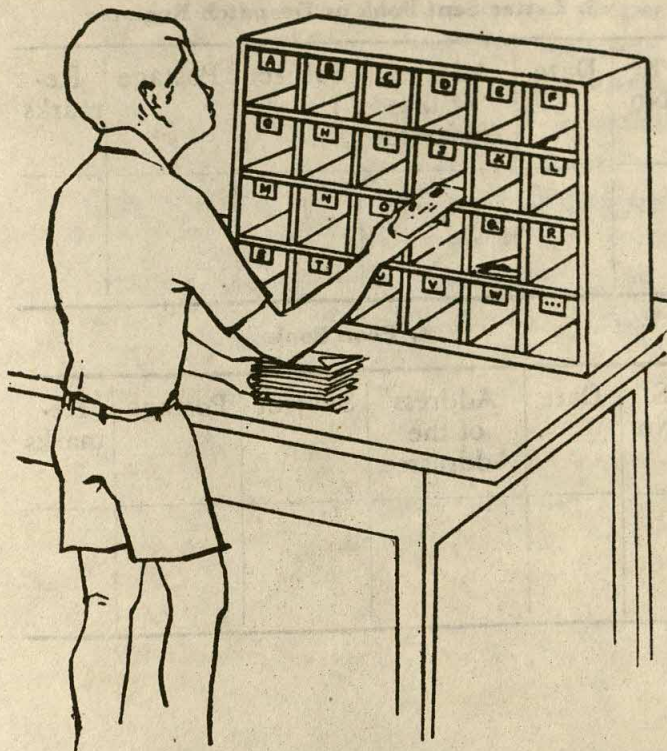


FIG. 4.4.2

5. Train the students to enter the outward mail in the despatch register.
6. Explain the advantages of maintaining despatch register.
7. Explain and train the students with the procedure of inserting letters in envelopes.

8. Train the students in different ways of writing addresses on letters.
9. Acquaint them with the exact denomination of stamps to be affixed on different categories of mail.

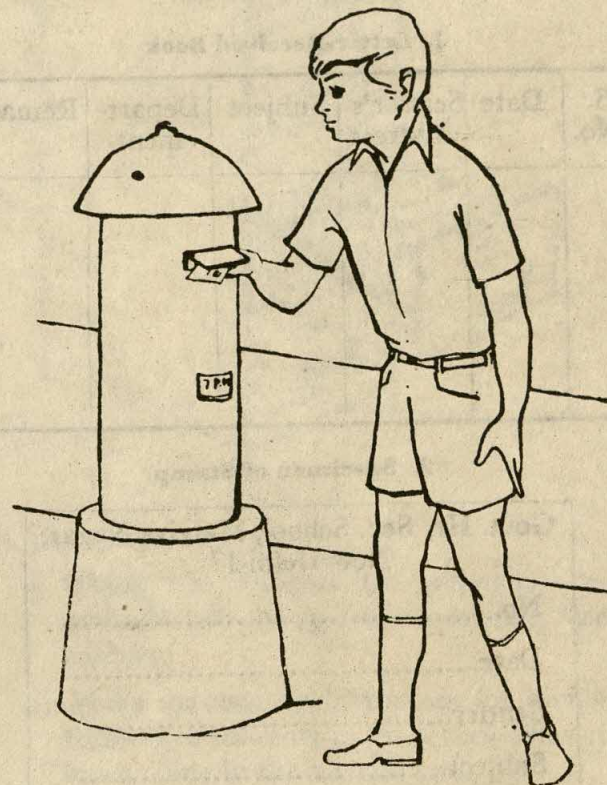


FIG. 4.4.3

10. Train them in using franking machine, if available.

11. Acquaint them with the method of despatching local mail through the peon.

SPECIMEN FORMS

1. Letter-Received Book

S. No.	Date	Sender's Address	Subject	Department	Remarks

2. Specimen of Stamp

Govt. Hr. Sec. School, Malviya Nagar,
New Delhi-17

No.....

Date.....

Sender.....

Subject.....

3. Letter Sent Book or Despatch Register

S. No.	Date	Address of the Addressee	Subject	Postage	Remarks

4. Peon Book

S. No.	Date	Address of the Addressee	Subject	Postage	Remarks

V. Filing and Indexing

(A) NATURE AND SCOPE

It is becoming essential for every individual to know about filing and indexing. Every individual wants to keep a record of letters he receives and writes. Even

papers other than letters require proper safety and system of maintenance. Indexing helps him to locate his papers and letters easily. At the secondary stage it is useful that students not only know about filing and indexing but they also operate and use these devices in their simple forms. It is therefore suggested that the scope of this activity should be limited to the simple system of filing and indexing.

(B) PRE-REQUISITES

MATERIALS. Different types of flat vertical filing system; simple index register; card index. Punching machine.

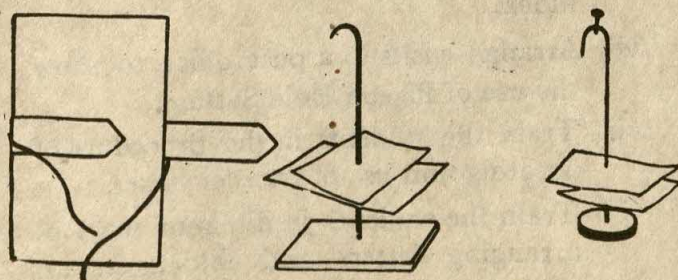


FIG. 4.5.1

PREPARATION. Teacher will guide the students in filing and indexing letters/papers.

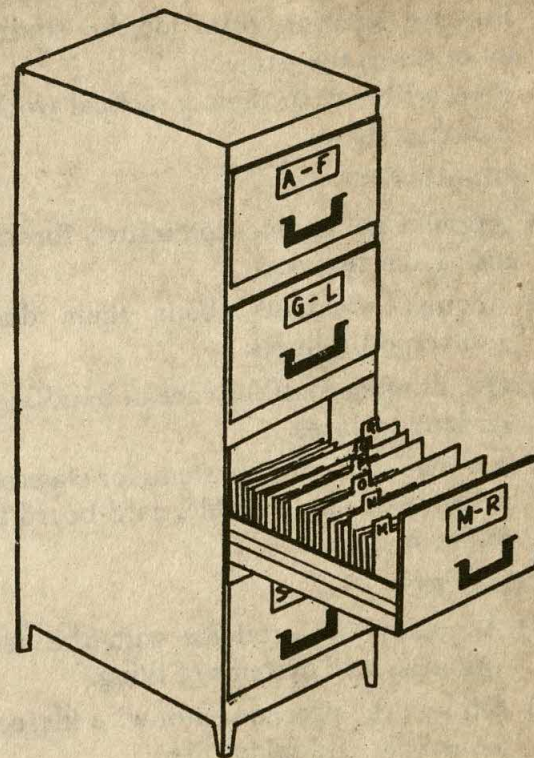


FIG. 4.5.2

(C) PLANNING

- i) Guide the students in preparing organisational set-up for conducting the activity.
- ii) Make necessary preparations for giving training to students in the school-office or in an office in the nearby area.

- iii) Prepare rotation rules for the students involved in the project.
- iv) Plan a library to show practical work of indexing done.

(D) ORGANISATION

- i) Appoint an ad-hoc committee for organising the activity.
- ii) Acquaint students about their duties and responsibilities.
- iii) Orient office staff for careful handling of student trainees.
- iv) Arrange some filing systems for classroom instruction like wire file, card-board file, folder file, etc.

(E) EXECUTION

- i) Acquaint the students with the need qualities and systems of filing.
- ii) Explain the procedures of wire file, card board file and folder file.
- iii) Train the students in alphabetical arrangement, numerical arrangement, geographical arrangement and subject-wise arrangement.
- iv) Explain to the students the advantages of vertical filing system with horizontal filing system.

- v) Explain the meaning and use of alphabetical, vowel and third letter indexing.

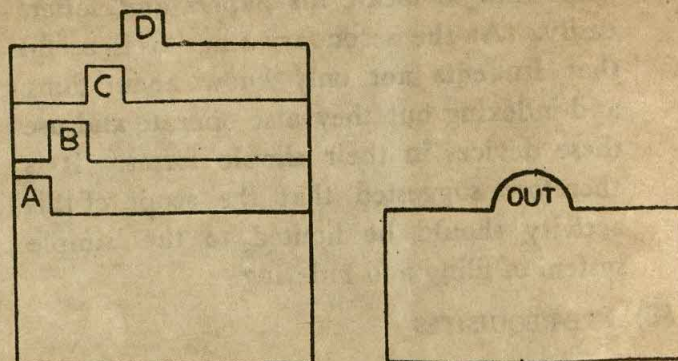


FIG. 4.5.3

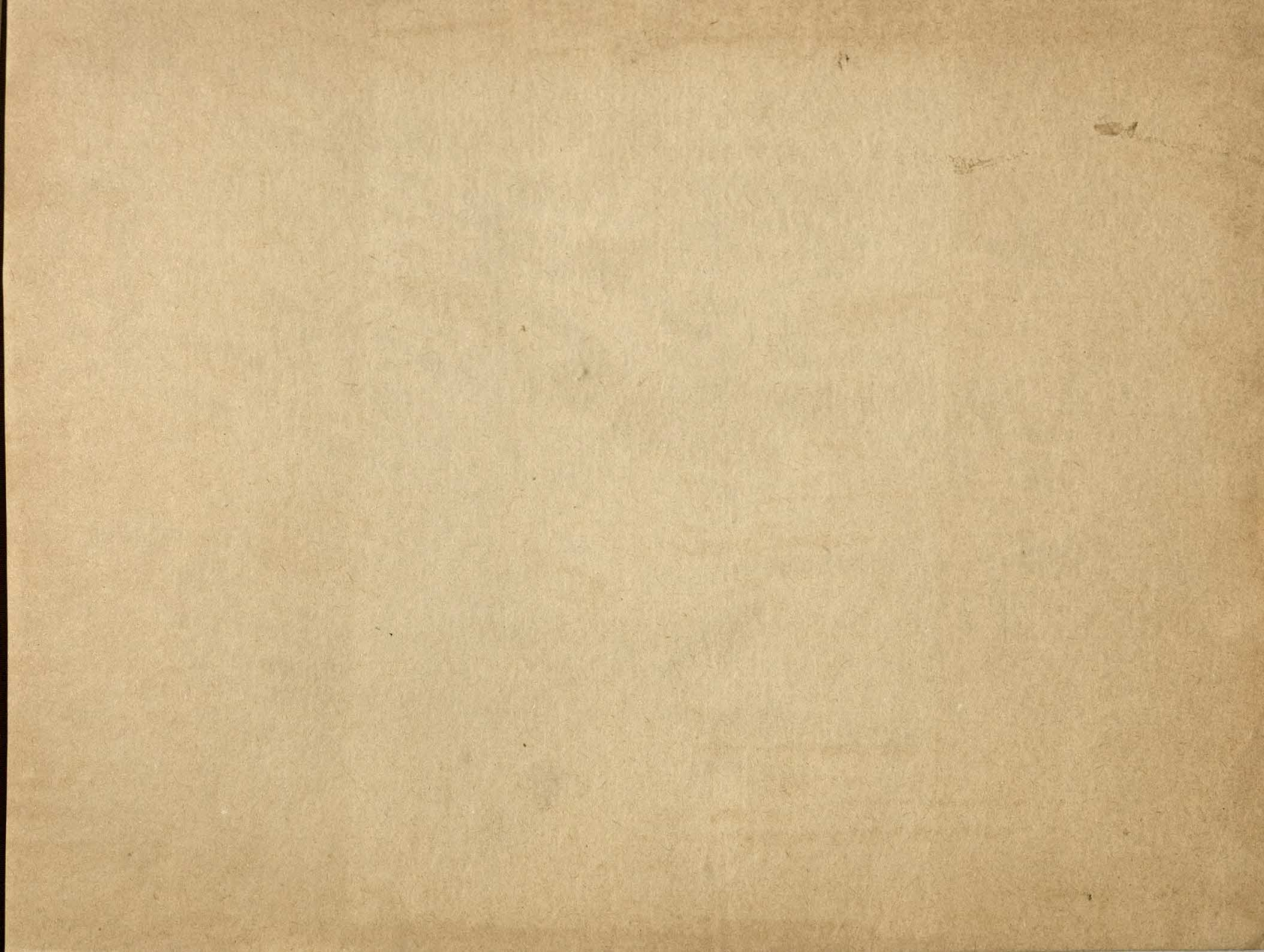
- vi) Acquaint the students with the procedure of letter index, card index and visible index.
- vii) Arrange visits to a post office to show the use of Pigeon Hole System.
- viii) Train the students in the procedure of locating and use of transfer boxes.
- ix) Train the students in different ways of arranging letters and folders in an almirah.
- x) Train the students in tracing old letters with the help of guide cards and absent



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